

THE
FERN BULLETIN

A Quarterly Devoted to Ferns

EDITED BY WILLARD N. CLUTE

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GARDEN

VOLUME X

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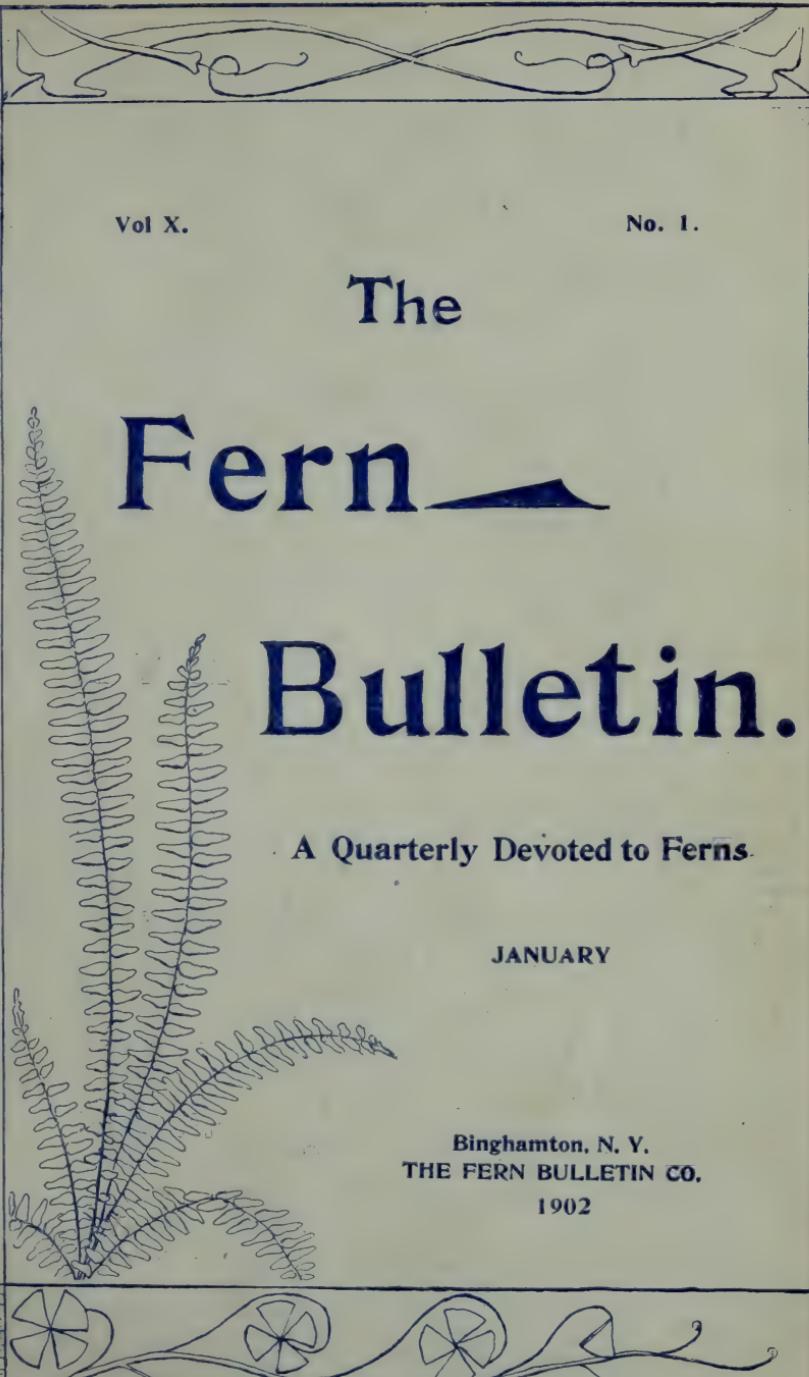


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WILLARD N. CLUTE, Editor

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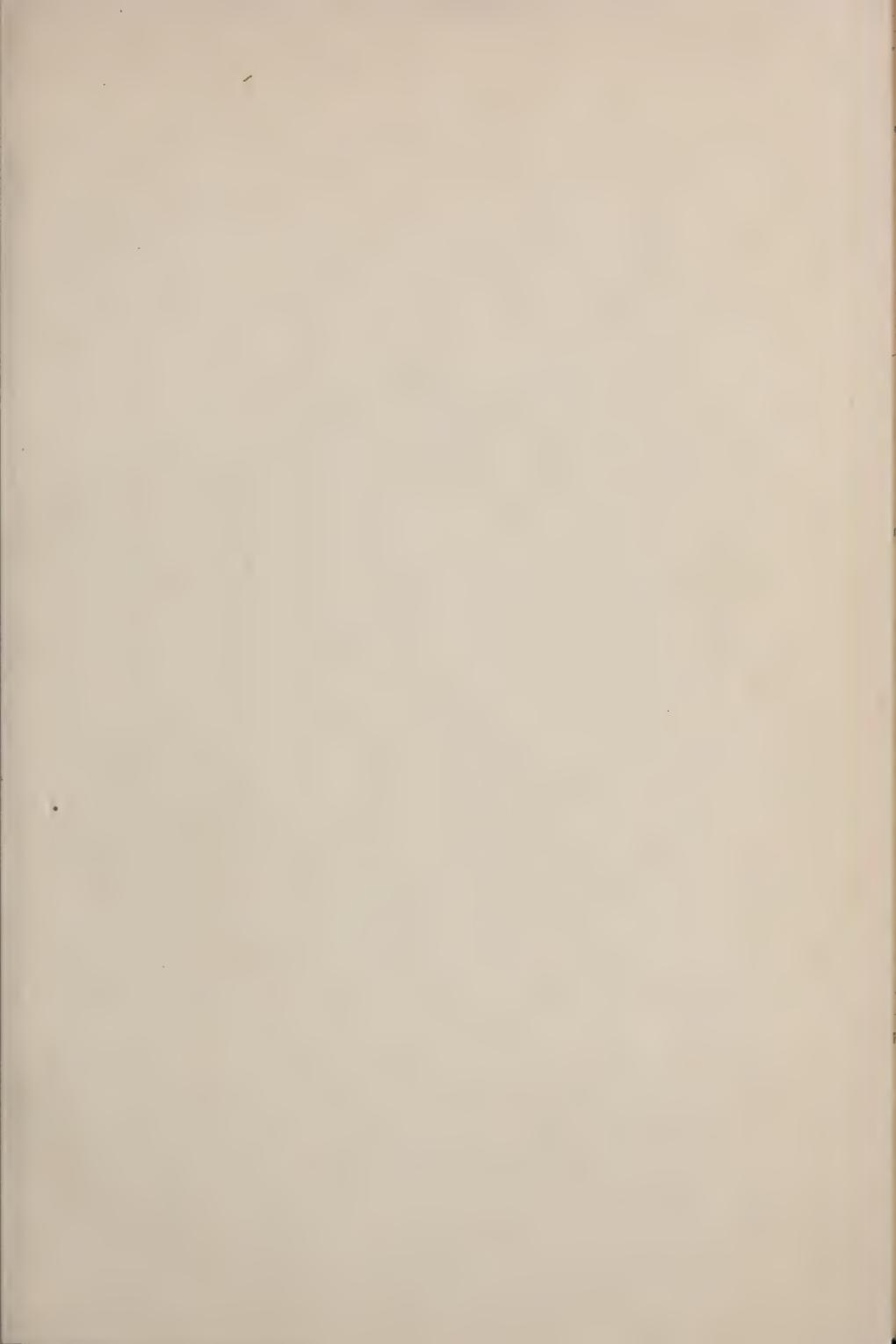
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FRANCES THEODORA PARSONS

THE FERN BULLETIN

VOL. X.

JANUARY, 1902.

NO. 1.

A NEW FORM OF *ASPLENIUM EBENOIDES*.

By C. E. WATERS, PH. D.

The recent discovery of an unusual form of *Asplenium ebenoides* brings up once again the question of the hybridity of this species. The latest paper on the subject of which I have any knowledge is one written by Mr. Maxon (*Botanical Gazette*, p. 410, 1900), in which he gives a history of the discussion, and then presents certain arguments in favor of the theory of hybridity. It has been of great assistance to me in the preparation of this paper.

As early as 1862 it was suggested by Berkeley that the fern might be a hybrid between *Camptosorus* and *Asplenium ebeneum*. Since that time nearly everyone who has written on the subject has held the same view. Professor Eaton and Mr. Redfield considered it a hybrid, and Professor Coulter in 1882 said that "the burden of testimony all seems to be in favor of that idea." One very important point bearing on the question was brought out most clearly by Mr. Davenport. He regarded it as "probably the best example of a fern hybrid that we have, the infrequency of its occurrence, the presence always of *Camptosorus* and *Asplenium ebeneum*, and the few plants found in the recorded stations, all going to favor the hypothesis of hybridization."

Mr. Maxon lays stress on its wide distribution in isolated localities where, as a rule, but one or two plants are found. The only place in which it has been found at all abundantly is at Havana, Hale county, Alabama, where it occurs at all stages of growth from prothalli to fully-matured plants. "They might arise from wind-blown spores, but in this event is it not a singular coincidence that the fortunate spore happens on each occasion to settle between plants of *Asplenium platyneuron* and *Camptosorus*?"

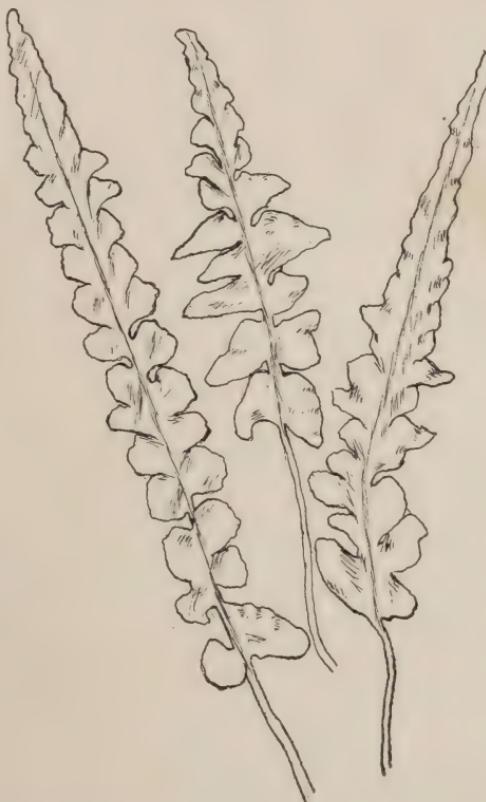
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It seems incredible to me, as a matter of probabilities, that any plant can be scattered from Vermont and Connecticut to Alabama, and be found only with the other two species, and so rarely, if it is not a hybrid between them. If it were more abundant it would be easier to look upon it as a distinct species, for similar plant-groups are familiar to every botanist. In 1897, Professor Murrill wrote an account of his discovery of the fern in Virginia. He concludes that it is "a distinct spleenwort." The botanies all state that the veins are free in our species of *Asplenium*, while the areoles are a prominent feature of the venation of *Camptosorus*. Professor Murrill says "another interesting link connecting it with the walking-leaf is the areolate structure of its veins," although Eaton and others say the veins are all free. Specimens from Virginia and Alabama, and my own from Maryland, show occasional areoles exactly like those of *Camptosorus*. But this evidence does not convince Professor Murrill as it once did the writer. That particular argument has recently lost much of its force by the recent discovery of numerous areoles of exactly the same type in fronds of *A. pinnatifidum* from Pennsylvania. Thirty-two areoles were counted in seventeen fronds of all sizes. Several fronds had four or five.

About the same time that the article written by Professor Murrill was published, Dr. Underwood gave an account of his visit to the Havana locality in the *Botanical Gazette* (xxii, p. 416, 1896). He found the plants in all stages from the youngest up to mature plants, and he concluded that it is not a hybrid but a well defined species, assuming that a hybrid is necessarily sterile. If this assumption be true, further argument is useless, and we can no longer look upon the plant as a hybrid, for it undoubtedly reproduces itself from spores at Havana. It seems to me that this argument is satisfactorily disposed of by Maxon. There is at least one well authenticated instance of fertility in a fern hybrid, namely, in the cross between *Polystichum angulare* and *P. aculeatum*. Would it not be possible then for *A. ebenoides* to be fertile even though other hybrids may have proved to be sterile? A piece of affirmative evidence is of more weight than much negative evidence. Of course the most conclusive evidence would be the actual production of a hybrid.

One of the peculiarities of hybrids is a decided tendency towards variation of form. This trait is quite marked in

Asplenium ebenoides. Plants from the Havana station resemble one another very closely, but they are quite different from specimens found elsewhere. The single plant recently found by the writer near Baltimore, Md., is quite unlike other recorded forms,



ASPLENIUM EBENEUM—three forms of fronds found near Baltimore.

and on the single root-stock were three fairly distinct types of fronds. Of these, one resembled somewhat the usual form, pinnatifid below, and with a nearly entire, slender prolongation above. In our specimen the prolongation is very wide in proportion to the size of the frond, resembling a short frond of *Camptosorus*. In the second form, there is no such prolongation,

as the frond is pinnatifid with very much rounded lobes up to the tip. Below it is pinnate with very irregular pinnae which are rhombic, deltoid, or oblong, and more or less auricled, and attached by a broad base. This form is least like *Camptosorus*. In the third form we have a linear frond about half an inch broad and five long, deeply lobed and much "crisped" except below, where there are a few pinnae attached by a broad base. In one frond these pinnae remind one of the segments of *Botrychium lunaria*. The fronds of form three are fertile, the others sterile except for a few scattered sori at the tip of a frond of the first type. Anastomosing veinlets are found in the first and third forms. The sori are borne irregularly as in *Camptosorus*.

Botanists who have seen these specimens or photographs of them have said that they are excellent evidence in favor of the theory of hybridity. It is certain that they are as clearly intermediate between the two supposed parent species as are the specimens usually found, and yet they are quite distinct in appearance from the latter. The fact that they grew near both parent species is not to be overlooked, and the position of the sori is also good evidence in favor of hybridity. Not so much stress can be laid on the character of the venation since we have the same state of affairs in *A. pinnatifidum*. In its stem characters it is also intermediate. The stipe and lower half of the midrib are dark brown and polished as in *A. ebeneum*. The upper part of the stipe is two-ridged on the sides so that it appears two-grooved in front. This is a characteristic of *Camptosorus*. In *A. ebeneum* the stipe is not ridged, and its fibro-vascular bundles resemble those of *ebenoides* more than those of *Camptosorus*. The length of the stipes connects them with *Camptosorus*. The writer is in favor of the theory of hybridity, but is forced to confess that the lack of a single pinna of typical *ebeneum* form is a difficulty not easy to set aside unless we assume that the *Camptosorus* exerts a greater influence upon the hybrid than does the other parent.

—Mr. Thomas Wareing reports collecting *Cystopteris fragilis magnasera* at Millbrook, N. J., and Mr. J. C. Buchheister also collected it in the Catskill mountains of New York. No doubt it will prove to be a common form.

NOTES FROM THE SOUTH.

BY WILLARD N. CLUTE.

Collectors and students of ferns have frequently lamented the fact that there are so few persons in the South interested in these plants, but if my experience is that of the average collector it is probable that this part of the world will never be noted for the number of its fern lovers. In November I rode directly north from New Orleans nearly three hundred miles, and in all that distance, although I kept a fairly close watch, I did not see a fern except the resurrection fern. I know, of course, that in the region traversed there are other ferns; but I cite this instance to show that they are not exactly plentiful. The season, it is true, was somewhat late, but I am sufficiently familiar with the aftermath of various common species to have noted them if they had occurred.

In the vicinity of the city of New Orleans even an ardent collector would find it difficult to work up much enthusiasm. Anywhere about the city you can dig down two feet and find water, and from the city limits in almost every direction stretches immense swamps of cypress and palmetto, with here and there a knoll of dryer ground peeping up from the depths; and yet in these places where everything seems suitable to a fine growth of ferns, I have not seen a single fern-plant in four months' collecting, except a single specimen of the marsh shield fern.

Of course this excepts the gray polypody or resurrection fern. This is a common species especially delighting in a position on the trunk or spreading main branches of the live oak. In the parks and along the public streets it is a common sight, but I never tire of seeing it. It seems particularly in keeping with the venerable appearance of its moss-draped host. In dry weather so well does it blend with the bark that none but a practical eye would see it; but when a stormy day comes, every frond is spread and drinking in life to the utmost. How it loves disagreeable weather! Thoreau's "cheerful community of the polypody" acquires a new significance with this species.

Last October as I was wandering along the levee which protects the city from the encroachments of Lake Pontchartrain, I found in the sedgy and bushy shallows of this great arm of the Gulf, a most surprising specimen, in the shape of the floating fern (*Ceratopteris thalictroides*). Until I fished it out of the

water it had never been found in the United States further north or west than Southern Florida. I found but a single specimen, but the locality was one that is not easily accessible either by wading or by boat, so I could not explore extensively. It is possible that it may yet be found in greater abundance. The spot where my specimen was collected is about 500 feet east of the street car landing at West End. The plant was in good condition and while it is possible that it has floated from Florida to these shores, its location and appearance are strongly against the supposition that it is adventive.

In the boggy ground back of the levees on both sides of the Mississippi a species of *Marsilia* is very abundant. It forms dense mats on boggy shores, from which it also sends floating stems out into the water. It is much like a patch of white clover in appearance, but even at a distance it is to be distinguished from clover by the livelier green of its fronds. I have set it down as *M. uncinata*, although the sporocarps are necessary to make sure, and these I have not yet found. Many plants were searched for them in vain. From what Mr. Julien Reverchon writes me from Dallas, Texas, I surmise that I was too late this year for the fruit. I hope to look for it again in the spring or early summer. He who finds a *Marsilia* in this part of the world does well to consider it *M. vestita* unless it is in fruit. My reasons for believing my plants to be *uncinata*, is that they are not pubescent, and they that are rather larger than those of *M. vestita* usually grow. Professor Underwood tells me that fruiting plants of *M. uncinata* have been sent him from this city, but whether they were collected here does not seem to be known at present. At any rate, this seems to be the first published record of the plant so far east. The sixth edition of "Our Native Ferns" credits it to Western Louisiana upon the authority of a botanist long since passed away. The books on the fernworts bear evidences that some species have not received sufficient study in the field. For instance, the *Marsilias* here mentioned have their height given, which is really only the length of the stipes, while not a word is said about the length of the plant, although it is a creeping species. It is not difficult to find stems more than a yard long with frequent branches.

It has never been my good fortune to see *Azolla Caroliniana* growing, until I came upon it at Southport, in the suburbs of New Orleans. I was still at some distance from the pool in

which it floated, when I identified it; but there was no chance of mistake. It covered the surface of the water completely, and grew in much closer mats than I have ever seen those flowering plants, the *Lemnas* or duckmeats, which in mode of life so closely resemble these flowerless ones. I tried to float specimens out upon pieces of paper, but they grew too thickly, so I brought home a large bundle of them to separate in a basin of water at my leisure. The pool was in full sun and the plants had a bright brownish red hue. I noticed, however, that on the shores, where the plants also rooted in the mud, they were bright green and concluded that the color was due entirely to location. In this I was glad to be confirmed by a letter received a few days later from Mr. A. A. Eaton, with which I will end this article by quoting entire for its interesting bearing upon this subject:

"I conducted a little experiment with *Azolla filiculoides* last winter to see just why it was sometimes red and at others green. I placed a pot of earth so it was half below the surface of my jar where I was wintering it. Being kept in the greenhouse it grew well all winter. That over the earth threw its roots into it and appeared to feed on the richness of the soil, as I had manured it highly. It grew very luxuriantly and was of a vivid green, not a hint of color. As soon as the edge of the pot was passed the roots were suspended in water without being able to reach the soil. The plants were smaller and of varying shades up to all red. This demonstrated that adversity alone is accountable for the color. To make assurance doubly sure, I removed all the red and changed some of the green from the pot to the water, where it soon assumed the red tint. The jar was in full sun all the time. I find it grows extremely well on a moist surface as on mud, better even than in water. I have seen ditches in California coated two inches deep with it, mostly red. This is doubtless owing in part to the extreme competition it was subject to. Cool mountain streams produced the green variety."

—Mr. S. Rapp, of Sanford, Fla., recently sent us a most interesting specimen of *Osmunda regalis* collected November 10th, 1901. In this specimen, which is in fruit, the sporangia are not borne in panicles, but upon the backs of the dilated leaflets. It is interesting to note that the sporangia are assembled in little sori on the backs of the veins and at some distance from the edges of the leaflets. The spore-cases are slightly smaller than ordinarily and the tip of the frond looks much like that of a *Nephrodium*.

THE SELAGINELLA OF NORTH AMERICA.—I.

BY LUCIEN M. UNDERWOOD.

The plants now known under the name of *Selaginella* were originally placed in *Lycopodium*. Two of our species were known to Linnaeus under the names *Lycopodium rupestre* and *L. apodum*. In all only twenty-four species of *Lycopodium* were known to Linnaeus in 1753, and of these only ten have been transferred to the genus *Selaginella*. In 1810 Willdenow enumerated ninety-two species of *Lycopodium*, of which thirty-four now belong to *Selaginella*. Spring wrote the first important monograph of *Selaginella* in 1848 and included 209 species. This remained the standard monograph until J. G. Baker of Kew revised the genus in 1887, adding largely from Spruce's South American collections, and raising the number to three hundred and thirty-five species. Numerous species have been added since that time and we have now the latest review of the subject in the treatment of *Selaginella* by Dr. Hieronymus, of Berlin, in Engler-Prantl, *Die Naturlichen Pflanzenfamilien* in which the number is raised to five hundred and fifty-nine species! Our two Eastern species represent two series of the genus which have formed the basis for separation into genera and it is not likely that these divergent types will always be held together. Of these *Selaginella rupestris* was long held to represent a single species. In 1865 Alexander Braun separated *S. tortipila*, originally collected by Rugel in North Carolina, and D. C. Eaton described *S. Oregana* in 1880, though the species had been described fifty years before by Presl under the generic name *Lycopodium*, with which the species of *Selaginella* were then associated. Milde, however, in reviewing the ferns of the North temperate regions of the Old World, had indicated ten varieties as early as 1867. My own studies in the genus led to the establishment of seven species in 1898 and Dr. Rydberg and Mr. A. A. Eaton have each added a single species to our list.

About a year ago Dr. Hieronymus of Berlin, took up the group of species involved in *Selaginella rupestris* and described a large number of new species from all parts of the world, including a number from our own country. I have already given a list of these in the FERN BULLETIN (IX, 50, Jl. 1901). In the recently

published Lieferungen (209, 210) of Engler-Prantl he gives a very full synopsis of all the species of the genus known to him, recognizing in what had formerly made up the single species *Selaginella rupestris* no less than thirty-six species! Surely our good critic from Boston will have his hands full in reducing all these to varieties or forms, and in reminding us that they did not do this in the good old days before descriptive botany really touched upon specific characters.

In order further to bring the views of Dr. Hieronymus to the notice of our students, I feel that no better service can be rendered than to present the following synopsis of his species so far as he briefly tabulates them in Engler-Prantl, reserving to a later article my own annotations on some of his species, some of which I had refrained from publishing myself for lack of sufficient material. It will be noticed that he accepts all species published by me as valid as well as Mr. A. A. Eaton's *S. cinerascens*, which he properly restores, as there is an earlier published *S. bryoides*.

SYNOPSIS OF THE NORTH AMERICAN SELAGINELLAE ACCORDING TO
HIERONYMUS.

Plants erect or ascending, emitting roots only in the lower part; leaves elongate-triangular, always pointed with terminal bristles.

Strobiles horizontal or at least not erect; microspores and macrospores dorsiventrally distributed.

Leaves without a hairy margin.....

.....*S. TORTILPILA* A. Br. (Carolina)
Leaves with 8-14 marginal hairs on either side.....

.....*S. RUPINCOLA* Underw. (New Mexico)

Strobiles erect; microsporangia in axils of upper sporophylls; macrosporangia in the axils of the lower terminal leaf-bristles 0.25-0.45 mm. in length..

.....*S. BIGELOVII* Underw. (California)

Terminal leaf-bristles 0.45-0.8 mm. long.

Leaves with 30 or sometimes 50 marginal hairs on either side.....*S. CHRISMARI* Hieron. (Mexico)

Leaves with 8-16 marginal hairs on either side....

.....*S. ARENICOLA* Underw. (Florida)

Plants creeping or forming prostrate spreading masses.

Plants creeping or often with thickly crowded climbing branches; branching stems, mostly not over 10 cm. long; leaves linear-elongate, diminishing toward the blunt ends.

Leaves without bristles at the ends or merely with short tips.

- Marginal hairs as long as 0.16 mm.....
.... *S. MUTICA* D. C. Eaton (Colorado, New Mexico)
Marginal hairs scarcely 0.08 mm. long.....
.... *S. CINERASCENS** A. A. Eaton (California)
Leaves with terminal bristle tips.
Bristles yellowish-green; leaves with 4-9 hairs on either side..... *S. WATSONI* Underw. (California)
Bristles white or whitish.
Macrospores smooth or nearly so.
Leaves with 6-9 marginal hairs on each side.....
.... *S. MONTANIENSIS* Hieron. (Montana)
Leaves with 9-15 marginal hairs on each side.....
.... *S. SCHMIDTII* Hieron. (Alaska)
Macrospores with amastomosing thickened ridges forming a distinct net work. (Besides the five American species of this group, it contains also *S. longipila* Hieron., from the Himalayas and *S. Siberica* (Milde) Hieron., from Siberia).
With 2-6 marginal hairs on each side of the leaf; terminal bristles 0.6-0.95 mm. long; strobiles 0.5-2 cm. long.. *S. ENGELMANNII* Hieron. (Colorado)
With 6-8 marginal hairs on each side of leaf; strobiles as long as 1.25 cm.....
.... *S. BOURGEAUI* Hieron. (Oregon)
With 8-12 marginal hairs on each side of the leaf; terminal bristles 0.55-1 mm. long; strobiles 2 cm. long; microsporangia wanting.....
.... *S. RUPESTRIS* L. (Eastern U. S.)
With 8-12 marginal hairs on each side of leaf; terminal bristle 0.9-1.4 mm. long; strobiles as long as 3cm. *S. HAYDENI* Hieron. (Oregon, Nebraska)
With 8-12 marginal hairs on each side of the leaf; terminal bristle 0.3-0.4 mm. long; strobiles 1.5cm. long, growing horizontally and with a dorsiventral distribution of sporangia.....
.... *S. WALLACEI* Hieron. (Oregon)
Plants creeping mostly with the ascending or spreading branches less crowded; branching stems mostly over 10 cm. long; leaves elongate-triangular or drawn out into an elongate triangle from a linear-elongate base, mostly ending in a sharp point.

*Dr. Hieronymus gives this in his synopsis as *S. bryoides* Nutt., but later corrects the synonymy because of an earlier *S. bryoides* which he revives from *Lycopodium bryoides* described by Kaulfuss in 1824. It is interesting to see how this Berlin doctor utterly disregards the Berlin "fifty year limit" in thus reviewing Kaulfuss' name, which according to approved American practice ought to be revived, but according to his own should not. How any one with any pretensions of familiarity with botanical literature and the practical working of rules of nomenclature can hold to such a frivolous suggestion as a "fifty year limit" is one of the things to be classed among psychological curiosities and amenities.

- Macrospores irregularly wrinkled.* Strobiles upright, normal. With 9-12 marginal hairs on each side of leaf; terminal bristles 0.25-0.45mm. long; strobiles 2cm long.....
..... *S. Wrightii* Hieron. (New Mexico)
- Macrospores with more or less regular net-like thickenings of the membrane (Besides this Californian species, this group contains *S. Montevideensis* Hieron. and *S. Peruviana* (Milde) Hieron., both from South America and both with erect strobiles).
Strobiles horizontal 5 mm. or less long; micro-and macrosporangia dorsiventrally distributed. With 8-15 marginal hairs on each side of the leaf; terminal bristles 0.3-0.45 mm. long; strobiles 0.5cm long with 10-20 marginal hairs on each side of the sporophyll.....
..... *S. Bolanderi* Hieron. (California)
- Strobiles over 5mm. long, erect; macrosporangia in the lower sporophylls, microsporangia in the upper. (Besides the following, this group contains *S. Wrightii* Hieron. from the East Indies).
With 5-7 marginal hairs on each side of the leaf; terminal bristle 0.16-0.3mm. long; strobiles 0.5-2 cm. long with 12-15 marginal hairs on each side of sporophyll.....
..... *S. Underwoodii* Hieron. (New Mexico)†
With 10-17 marginal hairs on either side of the leaf; terminal bristle 0.45-0.65mm. long; strobiles 0.5-1cm. long with 35-40 marginal hairs on each side of the sporophyll.....
..... *S. Sartori* Hieron. (Mexico)
- With 8-15 marginal hairs on either side of the leaf; terminal bristle 0.15-0.45mm. long; strobiles 1cm. long with 15-20 marginal bristles on each side of sporophyll.
..... *S. Aschenbornii* Hieron. (Mexico)

*Besides the single American species, this group contains the following exotic species: *S. Mildei* Hieron., *S. Arechavaletae* Hieron., *S. Sellovii* Hieron., and *S. Balansae* Hieron., from South America, *S. Njam-njamensis* Hieron., *S. cafforum* (Milde) Hieron., and *S. capensis* (A. Br.) Hieron., from South Africa, all with normal upright strobiles, and the curious South African *S. Dregei* (Presl) Hieron., with the strobiles horizontal, with the two upper rows developed as leaves and the two lower as sporophylls.

†The synonymy of this species is as follows:

Selaginella Underwoodii Hieron. *Dies naturl. Pflanzenf.* 1: 714
note. 1901.

Selaginella Fendleri Hieron. *Hedwigia*, 39:303, 1900. Not *S. Fendleri* Baker.

Selaginella rupestris Fendleri Underw. *Bull. Torrey Club.* 25:127,
1898.

Macrosporous smooth or with only slightly irregular or net-like wrinkles, but with a more or less distinct ring either equatorial or crown-like on the inner pointed surface.

Macrosporous tetrahedral or globose with slight crown-shaped rings on the outer surface. With 6-12 marginal hairs on each side of leaf; terminal bristles 0.6-0.8mm. long; strobiles as long as 9 mm.....S. HANSENT Hieron. (California)

Macrosporous lenticular, with a gibbose equatorial ring.

With 8-14 marginal hairs on each side of leaf; terminal bristles 0.08-0.15mm. long; strobiles 0.5cm. long.....S. EXTENSA Underw. (Mexico)

With shoots as long as 50cm. often with the branches and branchlets coiled like ostrich plumes, with 1-4 short marginal hairs on each side of leaf, very short terminal bristles, few marginal hairs on sporophylls, and macrosporous indistinctly netted on the basal side.

....S. STRUTHILOIDES (Presl) Underw. (Oregon)

SOME NORTH AMERICAN PTERIDOPHYTES.

BY B. D. GILBERT.

ASPLENIUM ANCEPS SOLANDER.—This species, which I announced in my Working List of N. A. Pteridophytes as growing in Florida, was originally described by Sir William Hooker in "Icones Filicum," with the name given to it which Solander had written on the label to his specimens in the Hookerian herbarium. In the Latin description, the rachis is said to be like the stipes, "black or brown-purple, shining, *triangular*, with the margins or angles narrowly winged." Further on Hooker remarks in English, that "this appellation (viz., *anceps*) is not entirely applicable to the *three* angles of the stipes and rachis." It is this point upon which I wish to comment. The Latin word *anceps* signifies two-edged, but it does not follow that the edges must necessarily be opposite each other. So far as I can judge from the examination of a large number of specimens, Hooker's description of the rachis as "*triangular*" is misleading. It is quite rounded on one side, so that it might be said to form a rounding obtuse angle. But the other two angles are sharp and stand one on each side of the furrow of the rachis. It is these angles which are "*winged*" with a series of lighter colored cells, and these angles are un-

doubtedly the ones which Solander had in mind when he named the species *anceps*. The name seems to me to be an eminently fitting appellation, when one takes into consideration the two winged angles which form the most prominent character of the species.

LYCOPodium TRISTACHYUM PURSH.—Dr. Underwood tells me that he examined Pursh's American specimens at the British Museum and that his *L. Tristachyum* exactly agrees with what has long been known as *L. Chamaecyparissus* A. Br. As Pursh's is the oldest name it must of course take precedence. At Alder Creek, N. Y., this species grows plentifully in sandy woods, but is replaced in open spots by *L. complanatum*. It bears fruited spikes much less freely than *complanatum*, is about a month earlier, the branches are longer, slenderer, more drooping, less rigid than the other, and, as has already been noted, the main stems are placed a little below the surface of the soil. So far as reported, it seems to prefer sandy soil and seldom grows in any other. Professor Peck, our New York State botanist, writes me that he has found it growing plentifully in Essex county, N. Y. So it is liable to be discovered in other localities also.

POLYPODIUM VULGARE ACUMINATUM GILBERT.—Fronds including stipes eight to twelve inches long, two to three inches wide, pinnae sixteen to twenty-two pairs acute to long acuminate, very irregular in length, also irregularly but not deeply crenate, texture somewhat thinner than in the ordinary form of *P. vulgare*, lowest pair of pinnae completely separated from others and usually bent in so as to touch each other on the face; color dark green above, pale green underneath. When this was first found it was thought to be Wollaston's var. *laciniatum*, described in Moore's "Nature Printed Ferns" as follows: "In this variety the lobes (pinnules) are of different lengths and simply but irregularly notched, and somewhat crisped or reflexed." This answers very well for a description of our variety, so far as it goes. But it says nothing about the acuminate pinnae, which form the most distinctive feature of *acuminatum*. It fruits sparingly toward the tips of fronds, and bears the same large sori as *P. vulgare*. It also has the same dark and wavy midribs, the veins running from which are generally once branched. Found October 5, 1901, on the face of a cliff at Fox's Fall, near Ilion, N. Y., growing in a clump three feet long and one foot wide. *P. vulgare*

grew in different places on the same cliff, but the *acuminatum* was very distinct from that. Two fronds in my herbarium, sent by Mr. M. W. Gorman, from Alaska, seem to possess nearly the same characteristics, but they are one-quarter larger than any of the Ilion specimens and considerably thicker in texture. Their veins also fork three or four times. For some time past I have been inclined to look upon our so-called *Polypodium vulgare* in Eastern North America as a distinct species from the European and Pacific coast species. Willdenow described a species which he called *P. Virginianum*, which he said differed chiefly from *P. vulgare* by having a non-paleaceous caudex. He gave its habitat as Hayti and Virginia. At the same time he stated that he had always received *P. vulgare* from North America under the name of *P. Virginianum*. I possess John Smith's copy of Willdenow's Cryptogamia, and in that he has made a note that *P. Virginianum* is only a variety of *P. vulgare*. I do not remember seeing any specimens without scales on the caudex, but there are other features of quite as much importance which seem to me to distinguish our species from that of Europe. However, I am not yet prepared to separate the two, which can only be done by one who has a large number of European as well as American specimens in his possession, in order to make the comparison complete and definite.

SOME ROADSIDE FERNS OF HERKIMER COUNTY,
NEW YORK.

By H. D. House.

It was my privilege last summer to traverse a considerable portion of the upper part of Herkimer county, New York. This county is extremely long from north to south, reaching from ten miles south of the Mohawk river to seventy-five miles north of it, and well up into the great wilderness of the Adirondack region. I took copious notes upon the roadside vegetation of this section, and later was surprised at the great number of ferns and fern allies which I had noted in roadside situations. The region, though once quite thickly populated, is now becoming deserted. In some townships nearly one-third of the homesteads are unoccupied and falling to decay. Civilization is slowly losing ground there, and this may account in part for the abundance

and variety of the roadside plants. However, the most important factor is the great variety of the conditions of environment. Some localities are sandy and desolate, others hilly and rocky. The roads pass through long stretches of rich woodlands, up beautiful valleys, past ponds, lakes and bogs, in short almost every condition of environment possible in this climate is found along these roads. In altitude the region varies from seven hundred to one thousand five hundred feet above sea level.

I began my observations at Newport, a village on the West Canada creek, about fifteen miles north of Herkimer. Here, where the road runs close to the creek bank, I noticed in great abundance close to the water's edge, the Joint Grass (*Equisetum littorale*). Along the White creek road, a few miles east are several outcropping ledges of Trenton limestone. Here I found the Brittle fern (*Cystopteris fragilis*, f. *magnasora*), the Bladder fern (*C. bulbifera*), and the Walking fern (*Camptosorus rhizophyllus*) in abundance with occasional specimens of the Maiden-hair Spleenwort (*Asplenium trichomanes*) and the Polypody (*Polypodium vulgare*). Some distance north of Newport the road passes through a lowland area which in places is swampy. Here the roadside was banked with great patches of the New York fern (*Nephrodium Noveboracense*), the common Wood fern (*N. spinulosum intermedium*) and *Dicksonia pilosula*, while here and there I noticed clumps of all three of the flowering ferns, *Osmunda regalis*, *O. cinnamomea* and *O. Claytoniana*; the last, frequently called the Interrupted fern, was less common than the others. A closer examination of the banks brought to light the Maiden-hair fern. Upon alluvial soil near by I found some fine clumps of that fern so aptly called the Ostrich fern (*Struthiopteris Germanica*). Beside the road in more swampy places the sensitive fern (*Onoclea sensibilis*), and the Marsh fern (*Nephrodium Thelypteris*) were very abundant, and grew close up to the wagon track. Upon rocky or sandy roadside banks between the towns of Norway and Gray, I frequently saw patches of the Long Beech fern (*Phegopteris polypodioides*). This is as near the central part of New York state as I have ever found this species of fern, though it may possibly be found in other places throughout Central New York. From Norway north and along the Fulton chain of lakes this fern is not rare. North of Gray and around the little village of Ohio, the

country is sandy with frequent peat bogs and ponds. At one place, beside a road near Ohio, I found five species of *Lycopodium* within a distance of a few hundred yards, *Lycopodium complanatum*, *L. lucidulum* and *L. obscurum* in the edge of a wood, and *L. inundatum* in a sandy depression. However, *L. clavatum* was the most abundant, some of its stems being many feet in length and all heavily fruited. With *L. inundatum* I found *Botrychium matricariaefolium* and *Selaginella apus*, the latter abundant. In many places along these sandy roads, thickets of the common Brake (*Pteris aquilina*) and berry bushes nearly hid the fences. In these thickets I found many of our common ferns, such as the Christmas fern (*Polystichum acrostichoides*), the Marginal Shield fern (*Nephrodium marginale*), *Botrychium Virginicum* and the rushes, *Equisetum arvense* and *E. hiemale*. The Lady fern (*Athyrium filix-foemina*) is a conspicuous roadside plant in many localities. There are several forms of this fern found in this region, their distribution depending apparently upon environmental factors. Along a roadside near Gray I found the Adder's-tongue fern (*Ophioglossum vulgatum*) and *Botrychium ternatum obliquum*. In a bog close to the road at Wilmurt, I found a few specimens of the Crested Shield fern (*Nephrodium cristatum*) and plenty of the Spreading Wood fern (*N. spinulosum dilatatum*).

The above named species are far from being all of the ferns that grow in Herkimer county, and doubtless many more of them may be found in roadside situations. It is seen that material for the study of the ecology of the ferns is not lacking even by the roadside. It is a significant fact that of the many species of *Asplenium* found in this region, only a few specimens of one were found by the roadside, while on the other hand, the genus *Nephrodium* was largely represented in roadside situations by nearly all of its local species.

HELPS FOR THE BEGINNER.

VI.—THE CLUB-MOSSES.

Once more the holiday season has brought the club-mosses into prominence. Of course the botanist and the lover of wild nature knows what a club-moss is, but many others, perfectly familiar with these plants, would scarcely recognize them by this

name. The species used for decorations at Christmas time are more commonly called running pine, ground pine, or simply evergreens, although the moss-like sterile portion and the club-shaped spikes of fruit make the usual botanical name singularly appropriate.

The club-mosses are easily recognized. Most of the common species have a trailing vine-like stem, from which branches rise at intervals, bearing great numbers of scaly or awl-shaped leaves. The fruiting spikes also readily distinguish them. They resemble an elongated pine cone in miniature. Under each scale of this little cone, in the place that seeds are borne in the pine cone, will be found the kidney-shaped spore-cases. These contain great quantities of spores, as may be seen by shaking a ripe spike. In some parts of the world these powdery spores are collected for the market and they may be found in any drug store under the name of *Lycopodium*.

One of the most interesting peculiarities of these plants is the way in which they move over the ground. Not that any of the species as a whole has the power of movement; but the axis is so rapidly added to at one end while as rapidly dying at the other, that the individual plant is soon carried away from the place in which it started. Indeed it may be a question for the metaphysician to decide, whether after a few years it is the same plant. Although its life has been uninterrupted it is not in the original place, nor does it possess the same leaves, branches and roots it had at the beginning.

The club-mosses are hardy species and elect to grow on desolate barrens and rocky wastes on the very edge of the world, as it were. They are very common in northern lands and love mountain slopes. In such places the common club-moss (*L. clavatum*) is likely to be found. Its slender stem, thickly set all round with awl-shaped leaves, and its spikes on long stems will distinguish it. In cold, wet woods there is another species—*L. annotinum*—that is much like it, except that the spikes of fruit are sessile at the ends of the branches. Near the common species one is likely to find *L. complanatum* with flat, fan-shaped branches, like arbor vitae, that cannot be mistaken. Its spikes are also on long stems. In rich woodlands there is a species which grows a foot or more high and resembles not a little a pine tree. This is *L. obscurum*. The clubs are sessile at the



A form of *Lycopodium alopecuroides*.

ends of the branches. In wet woods, especially in hemlock woods, is a species (*L. lucidulum*) like a gigantic moss that seems an anomaly among its kind, for it does not bear spore-cases in spikes. They are in the axils of the upper leaves and being rather large and bright yellow, ought easily to be noted. In northern bogs may be occasionally found a small club-moss with one or two short bushy spikes and a sterile portion that is

noted for forming an arch of each season's growth. This is *L. inundatum*. In similar places in the south will be found *L. alopecuroides*, which is much like it, but larger. Northern specimens of the latter are hard to separate from *L. inundatum*. Our illustration is made from such a specimen.

Last and least there is *L. Carolinianum*, with a very short sterile portion flat on the earth and a slender spike often not more than three inches high. It grows in bogs from New Jersey southward. In the Eastern States there are a few more rare species not here mentioned. If the young collector should happen to find them, it will be easy to separate them by a reference to the nearest botanical manual.—*W. N. C.*

FALL FRUITING OF OSMUNDA.

By W. C. STEELE.

I have never seen but two species of *Osmunda* in Florida, namely, *O. regalis* and *O. cinnamomea*. Dr. Chapman in his "Flora of the Southern United States" says that *O. Claytoniana* is found within the district covered by his botany, but does not credit it to Florida, and I have never seen a specimen in this state. *Osmunda regalis* grows around here, but not very abundantly. *Osmunda cinnamomea*, on the other hand, is one of the most common ferns in this section. Perhaps it would come third on the list. *Pteris aquilina* var. *caudata* would come first, being found almost everywhere. The second would be *Woodwardia Virginica*.

But this was not what I started to tell. Both species of *Osmunda* send up a crop of fertile fronds in the spring, and *Osmunda cinnamomea* has a habit of sending up a second crop of fertile fronds in the fall. Not every clump, nor even one-half of them. But enough to be very noticeable.

In some places nearly or quite one-half the plants show this fall crop of fertile fronds. In other places only here and there a plant will have them. The editor of the FERN BULLETIN in a private note asked the question whether it might not be that the sterile fronds on these fall fruiting clumps had been destroyed by some accident. Such, however, is not the case. It may be, probably is, the cause of three clumps of *O. regalis* sending up fertile fronds in October. These three were within the fence of

my home lot and lost all their sterile fronds by the trampling of a horse tied out to graze. In the case of *O. cinnamomea*, however, the sterile fronds are usually all present, often as perfect as ever, but sometimes turned brown and about dead.

We have never in the past marked any clumps to be able to say positively whether the same plants fruit twice in one year or not. Will try to do so this fall and watch next spring to see if the same clumps send up fertile fronds then.

FRANCES THEODORA PARSONS.

Without doubt the writer who has done the most to popularize the study of ferns in America, bears the name of Frances Theodora Parsons. To her belongs the unique distinction of publishing the first book on ferns for the general reader—a book that one does not need a botanical education to understand. Although first issued less than four years ago, "How to Know the Ferns" has already gone through two or more editions, and will always remain one of our most valued contributions to the literature of ferns.

Mrs. Parsons began life in New York, December 5, 1861, as Frances Theodora Smith. She first married Commander William Starr Dana, of the United States navy (who died abroad), and as Mrs. William Starr Dana wrote "How to Know the Wild-flowers" (1893), "According to Season" (1894), and "Plants and Their Children" (1896). All of these have been most successful, especially "How to Know the Wild-flowers," which according to report has sold nearly seventy thousand copies—a most phenomenal circulation for an "out-of-door" book. An enlarged and illustrated edition of "According to Season" is now in press.

On February 8, 1896, she married Prof. James Russell Parsons, Jr., Secretary of the University of the State of New York, and also an author of note on pedagogical topics. At present they reside at Albany, N. Y.

Mrs. Parsons' work is characterized by an easy and graceful style, coupled with a thorough understanding of her subject. Her books are conspicuously free from the slips so common to many writers who attempt volumes for the general public. To Mrs. Parsons and to Messrs. Charles Scribner's Sons we are indebted

for the use of the photograph which we have pleasure in producing elsewhere in this number.—*W. N. C.*

A NEW FORM OF OSMUNDA CINNAMOMEA.

By C. E. WATERS.

About the middle of July, while collecting *Woodwardias* and *Dryopteris simulata*, my attention was attracted by the rusty appearance of a plant of *Osmunda cinnamomea*. Investigation showed that this was not due, as at first supposed, to a parasitic fungus, but to a rather dense glandular pubescence. Later, on the 28th and 31st of August, further search was made and plants having this peculiarity were found in abundance. Both the variety and the typical form of the species grow in large numbers in low sphagnum woods near Glen Burnie, in Anne Arundel county, Maryland. It cannot be said that the variation is due to peculiarities of soil or to varying amounts of sunlight (which explanation suggested itself at first), for the two forms grow side by side all through the woods. It is my opinion that we have a distinct variety, which it is proposed to name variety *glandulosa*.

The pubescence is not of the ordinary form, that is, composed of simple hairs, but is distinctly glandular, the hairs being enlarged at the tips and covered with a sticky substance. The pubescence of early summer is of an entirely different character. In some of our specimens the latter was still adherent to the stems and along the midribs of the pinnae as late as August 31, but I think it was held in place by the sticky secretion of the glandular hairs. It was noticed that many of the fronds adhered to the driers in much the same way that *Dicksonia* does when pressed.

In *Osmunda cinnamomea* forma *glandulosa* the outlines of the fronds and pinnae, stem characters, and vernal pubescence are as in type. The pinnae are more or less densely glandular-pubescent below, especially along the midribs and veins and smooth or glandular-pubescent along the veins above. The rachis and upper part of the stipe is also glandular-pubescent.

Fronds from two to five feet tall were found, and in some instances the stems and pinnae appeared rusty from the glandular hairs. The variety can often be distinguished by touch. The specimens in the Gray and the New England Botanical Club

Herbaria were examined, but none of the new form was noticed. Fronds have been sent to the National Museum, Gray Herbarium and several private herbaria.

TWO NEW FERN LISTS—II.

By GEORGE E. DAVENPORT.

In a "Working List of North American Pteridophytes with Descriptions of a Number of Varieties Not Heretofore Published," Benjamin D. Gilbert, the author, gives us to understand from his preface that his special purpose has been to put into the hands of fern students an up-to-date check list for practical use in making exchanges and preparing herbaria, and he has certainly succeeded admirably in what he has undertaken.

In the carrying out of his plan he has made no attempt at a systematic arrangement, but adopted an alphabetical order for the greater convenience of ready reference, the different forms enumerated being numbered consecutively from 1 to 438, with an addition of six half numbers, making a total of 444. Of this number 187 represent species of ferns, as against Mr. Maxon's 196, and 111 fern varieties or forms, which is a much greater number than Mr. Maxon recognized, and which swells the total number of fern plants to 298, by far the largest number yet published in this country.

Under varietal names Mr. Gilbert has succeeded in bringing together about every form known to have been recognized in any way, at any time since the earliest history of American Pteridology, besides adding many new ones.

Many of these forms are unimportant, but as a matter of record, and keeping in mind the special purpose for which the enumeration was intended, no serious objection can be made to the presentation of so many unusual forms, as nearly all collectors like to obtain as many as possible, and Mr. Gilbert's list will be immensely helpful for that purpose.

Some of the species enumerated, however, fall under a more serious criticism, and the whole number given may be safely somewhat further reduced. It is scarcely worth while, for instance, to adopt such species as *Botrychium tenebrosum*, it being merely a weekly developed growth of *B. matricariaefolium*, as long ago determined by Professor Eaton, and now

so recognized even by Dr. Underwood. The claims upon which its specific assignment rests are not in any way sound or acceptable. The assumed difference in its time of fruiting and the character of its habitats dwelt upon by its author, have no force, as the fruiting period of *L. matricariaefolium* extends all the way from May to October and the species has been found in a great variety of situations. Even if under some conditions *tenebrosum* should mature spores in advance of normal *matricariaefolium*, it would not prove anything, as the early, and even abnormal fruiting of depauperate and weakly developed forms is not an uncommon thing in the vegetable kingdom. But such characters are not specific. Equally objectionable is the adoption of species in the *ternatum* group, which have nothing but a difference in the size of the plant to recommend them. In a climate so extraordinary as California, where vegetable productions common to other sections reach most unusual proportions, it is not surprising that *B. ternatum* should attain such a development as characterizes the form known as Presl's *silaifolium*, but which is merely the highest evolution of *ternatum*.

Absurd as the comparison may seem, it is no more unreasonable to consider the boy and the man as representing two distinct races than it is to consider the exuberant California form of *B. ternatum* as specifically distinct from its smaller companion growing by its side, or far away in some distant state, because the differences are merely those which represent different states of development under varying conditions of growth and environment.

In the treatment of genera Mr. Gilbert has brought his work into general harmony with the best workers, and he is undoubtedly right in adopting *Athyrium* and *Nephrodium*.

The most interesting part of Mr. Gilbert's catalog is the "appendix" into which he has infused so much of his own life, as it were, and here his observations are especially rich in valuable information and descriptive matter. Whether all of the new forms described are entitled to the consideration given to them, or not, is an open question, but in any case the author's judgment possesses more than ordinary value and his views are entitled to careful consideration. Some of the forms, however, appear to rest on characters altogether too trivial, and it is especially hazardous to propose new varieties of *Athyrium flix-foemina* where there are already upward of three hundred or more named

forms, every one of which it would be necessary to examine before it would be possible to know whether another was new or not; indeed there is too much reason to fear that some of the forms described here under new names have already been published abroad under others.

However the List as a whole is to be warmly commended as the most complete enumeration of American fernworts yet published. It supplements admirably Mr. Maxon's carefully prepared and more systematic catalog and the two Lists constitute a complete presentation of the different attitudes of the radical and conservative workers of the present day that should be in the hands of all fern students.

Mr. Gilbert's attitude on the nomenclatorial question will especially excite the liveliest interest in his work, as, like Mr. Clute's Fern Book, it emanates from the very heart-centre of the Rochester atmosphere which might be expected to influence his views, yet here he has set aside the extreme views of the Rochester advocates and given in a very clear and concise manner his reasons for adopting the sounder principles of nomenclature which recognize the first correct generic and specific combination as the true name of a plant.

Medford, Mass.

NOTES ON SOME RARE WASHINGTON FERNS.

By J. B. FLLETT.

There is a region of country about thirty miles in extent between the prairie country lying southeast of Tacoma and the base of the Cascade mountains, about which little is known botanically only that it is covered with heavy timber and dense underbrush.

A rocky precipice rising abruptly 500-1000 feet a few miles back in the woods proved to be a natural fernery. At the base grew *Polystichum munitum incisoserratum* as high as my head. The common brake, *Pteridum aquilinum pubescens*, 6-8 feet high, several forms of *Athyrium cyclosorum*, the Maiden-hair and Deer ferns. The trees at the base were covered with a dense growth of liverworts and mosses. Among these grew *Polypodium falcatum* in great abundance, though small compared with its growth on the rotten logs in the dark woods. Higher up on

the rocks it approached the Eastern form of *P. vulgare* very closely. In the crevices of the porphoritic rock *Polystichum Californicum* was wedged in so that it was difficult to get it out. Many fine plants were just beyond my reach. There were three forms of the species. One answered to the description of *P. Californicum*, the smallest form to *P. Scopulinum*. These two run into each other imperceptibly. Neither of them is worthy of specific rank. The third form of this group was recently found at the base of the precipice already referred to. It is a rare form. It is said to be different from any described variety, but approaches what Eaton called *lobatum*. It is much larger than the other forms. Its shape and habit of growth is very similar to that of *P. munitum*. It fruits like the *P. aculeatum* group. It occurred to me that it might be a hybrid between the two species just mentioned.

Among the talus in a shaded portion was found *Gymnopteris triangularis*. It grew quite abundantly between the loose stones and rocks. This form is rare in this locality. It is said to grow on the San Juan Islands in a limestone region, but the writer had never seen it growing in its natural habitat before. There was no limestone here. The formation was porphoritic.

Cryptogramma acrostichoides grew in close association with the above. This is not a rare fern in the mountains of this state. It is common in glacial regions about the volcanic peaks. It was somewhat larger in this favorable station. I never saw this plant at so low an altitude before.

The precipice itself was covered as with a web of *Salaginella Struthioloides*. This hangs down over the rocks gracefully much like a *Lycopodium*, though very slender. A space of about three hundred square feet was thus covered. This is another rare plant in this region. It is also reported from Gray's Harbor on the Pacific Coast in this state.

—Why is *Lomaria spicant* called the “deer fern?” While in Southeastern Alaska this summer, I noticed that the deer were very fond of eating the fertile fronds of this species. It was very difficult to find enough for a good series of specimens. Does this have any bearing on the common name?—J. B. Flett. [Mr. Flett is correct in his surmises about the name. It has been stated in print that the deer are so fond of the fronds that they paw away the snow in winter in order to get at them.—Ed.]

A LIST OF THE FERNWORTS COLLECTED
IN JAMAICA.

BY WILLARD N. CLUTE.

(Continued.)

ASPLENIUM L.

90. *A. dentatum* L. In caves and on moist rocks at Manchioneal and Bath Fountain. Seldom seen. (287).
91. *A. Clutei* Gilbert. At base of a large rock in the fores beyond New Haven Gap. (115a).
92. *A. alatum* H. B. K. In wet shades, Morce's Gap. The fronds are winged with membrane and freely rooting at the apex. (94).
93. *A. lœtum* Sw. Wet rocks, Cuna Cuna Gap. Not common. (331).
94. *A. lunulatum strictum* Brack. Clyde River, not common. Verified by B. D. Gilbert. (135).
95. *A. falcatum* Lam. On dryish rocks, Cedar Valley, com mon. (150).
96. *A. præmorsum* Sw. Open banks near Latimer River. A curious fern with forking pinnules. (340).
97. *A. cuneatum* Lam. In forks of trees and on old logs. Above Moore Town. (278).
98. *A. auritum* Sw. On rocks and trees, Cedar Valley and Moore Town. The ears of the pinnæ are erect and the pinnæ on long stalks give the centre of the frond a peculiar ladder-like appearance. (152).
99. *A. fragrans* Sw. Moist shades. Morce's Gap. The fronds are dark glossy green, rather fleshy, and when picked soon give out a strong pleasant fragrance which often remains in the dried specimens. (56).
100. *A. myriophyllum* Spreng. Clyde River, not common (130).
101. *A. rhizophorum* L. Moist shades, Clyde River. In "Ferns of Jamaica" Jenman says this is "the most polymorphic of local ferns" and names several varieties. My plants are to be referred to the variety *pinnato pinnatifidum* Hook., the variety *gracilis* (Jenman's var. A.) and the variety f. of Jenman. (257).
102. *A. juglandifolium* Lam. Rare. Above Gordon Town. (239).

103. *A. grandifolium* Sw. Wet forest above Moore Town. Not very common; at first glance easily mistaken for the following. (332).
104. *A. celtidifolium* Mett. Common on moist banks, Morce's Gap. Fronds appear as if thick and coarse, but when dried they are quite thin. (92).
105. *A. Shepherdii* Spreng. Moist shades above Moore Town. (291).
106. *A. costale* Sw. Common at Morce's Gap. A tall coarse fern, reminding one of *Woodwardia Virginica* in shape of the fronds. (93).
107. *A. striatum* L. Above Moore Town. Common. This when not growing with *A. costale* might easily be mistaken for it. (267).
108. *A. radicans pallidum* Jenm. New Haven Gap. (107a).
109. *A. arboreum* Willd. Moist rocks, road to Morce's Gap. Plentiful. This is not a tree fern, notwithstanding its name. (69).
110. *A. Franconis* Mett. In moist shades above Moore Town. Not common. (276).
111. *A. conchatum* Moore. Latimer River and New Haven Gap. Common. (143).
112. *A. altissimum* Jenm. In shade, New Haven Gap. Verified by B. D. Gilbert. (107).
113. *A. Wilsoni* Baker. Moist shades, New Haven Gap. Verified by B. D. Gilbert. (106).
114. *A. marginatum* L. In moist forests, Cuna Cuna Gap. Not common. This is the largest of the *Aspleniums* with great, simply pinnate fronds that remind one of the tree ferns. The rootstock is very short. (293).

A CORRECTION.

Mr. Davenport has called my attention to the fact that while the specimens of *Botrychum lanceolatum* and *B. neglectum* sent by me to the Gray Herbarium are on the same sheet, they are differently labeled in the handwriting of Dr. Watson. This recalls to mind that when working at the Gray Herbarium in 1891 I called Dr. Watson's attention to the fact that they were distinct species and it is probable that he made the correction in accordance with my suggestion. This latter fact had been forgotten when writing my article in the FERN BULLETIN for July.—*L. M. Underwood.*

EDITORIAL.

Although this number was partly made up as early as November, it is already apparent that it cannot be issued on time. In future we shall try to be more prompt. Those who have articles for a particular issue should bear in mind how early the issues are made up and not wait until the last minute to send in their "copy."

* *

We advanced the price of the enlarged FERN BULLETIN with some misgivings as to the outcome, but fully determined to hold to this course for at least a year. The result has been even better than expected. We have not lost a dozen subscribers through the change in price, and our gains in new subscribers have been greater during the past three months than for any similar period in our history. We do not make these statements with a desire to boast, but for the information of the many friends of the journal who have often indicated their interest in its success. To all of those who have so ably seconded our efforts in the past, we desire to renew our expressions of indebtedness, and to all our readers we wish a most happy and prosperous new year.

* *

An amusing instance of how a scientist can become so used to the appearance of plants in the herbarium as to forget their looks afield was noticed recently in a review of "Our Ferns in Their Haunts." The reviewer, who is a very prominent fern student, said: "Rural scenes and other miscellaneous landscapes with a fern of some sort placed in one corner as an afterthought or adaptation of the artist, do not bring out the true relation of the ferns to their surroundings as might easily have been accomplished book, when it becomes sheer nonsense. As a matter of fact, the artist made all but two of the illustrations in question in the haunts of the ferns themselves, and the pictures are faithful transcripts of New England scenery from the brush of the true artist. It is possible that there will always be some people who prefer the work of the "kodak fiend" to that of the artist, but happily such people are rare among fern lovers.

With regret we note the death of Thomas Meehan, senior editor of *Meehan's Monthly*, which occurred at Germantown, Pa., November 19, 1901. A biographical sketch with portrait was printed in the October BULLETIN.

* *

It must be a source of satisfaction to every member of the Fern Chapter to know that it is accounting for itself satisfactorily. The work it has done and is doing to stimulate a popular interest in ferns has recently been commented upon very kindly by Prof. C. E. Bessey in *Science*, and by the editor of the *Plant World* in that journal. It is also a matter for congratulation that each year since the Chapter's organization the membership has constantly increased.

BOOK NEWS.

To those who are interested in poetry relating to flowers, we take pleasure in recommending "Among Flowers and Trees With the Poets,"* by Wait and Leonard. This volume is a compilation from many sources and is especially strong in quotations from recent or contemporaneous writers. The minor poets, who, by the way, are not always producers of work in a minor key, are well represented. No longer do the poets rave of the lily and rose. In this book are many entire poems to such plants as arethusa, bitter-sweet, rudbeckia, bloodroot, burdock and even the lowly chickweed. It is a good book to have on the library shelf. Many an hour may be profitably spent in browsing through its pages.

The third of a series of botanical works in which author and artist have joined forces has recently been issued by the F. A. Stokes Co. It is entitled "Southern Wildflowers and Trees,"† and is the first book to treat of the noticeable plants of the South in untechnical language. The book follows the Engler-Prantl ar-

**Among Flowers and Trees with the Poets*, compiled by Minnie Curtis Wait and Merton Channing Leonard. Boston: Lee & Shepard, 1901; 8vo. pp. 415.

†*Southern Wildflowers and Trees*, by Alice Lounsberry, illustrated by Mrs. Ellis Rowan. N. Y.: Frederick A. Stokes Co., 1901. 8vo. pp 565; \$3.65 net.

rangement of families, which is to be commended, but the nomenclature is of the most radical type, and lacking as it does all synonymy is likely to be the source of many troubles to the beginner trying to match knowledge gained from other books with this one. There is a fairly workable "key to the families," and the popular matter relating to each species is prefaced by an accurate technical description. The language of the untechnical parts is scarcely to be approved. Apparently the author has gone out of her way to bring in uncouth and involved methods of expression. Nevertheless, this part of the book contains a vast amount of interesting matter. The illustrations are good, and taken all in all the book is likely to be found very useful to the Southern botanizer.

From the author of the three-volume "Illustrated Flora" we now have the "Manual of the Flora of the North Eastern States and Canada,"‡ which by omitting the illustrations and by the use of smaller type, condenses the three volumes into one for school and field use. The publishers have acquitted themselves very creditably, but the author has made a book that seems likely never to take the place with the majority of botanists now occupied by Gray's and Wood's "Manuals." In the interpretation of genera, species and sub-species the author goes to even greater lengths than he did in the "Illustrated Flora." Many genera in this new volume contain twice as many species as are given in "Gray's Manual" for the same range. A large number of these additional species are "segregates," that is, split off from other well-known species. Doubtless time will show some of these to be good species, but it is just as certain that when the botanical pendulum swings back again many of them will be finally placed as varieties or sub-species. The nomenclature follows the much vaunted "Rochester Rules," and of course differs in many places from the "stable" nomenclature of the "Illustrated Flora." It may be asserted without question that botanists do not care what nomenclature is used so long as a name once given remains unchanged. That the "Rochester Rules" will not accomplish this is shown in the work of this author, himself the chief exponent of these rules. It is but recently, probably since much of this work

‡*Manual of the Flora of the North Eastern States and Canada*, by N. L. Britton, N. Y.: Henry Holt & Co., 1901. pp. 1,080.

was written, that attention has been directed to the lesser values of plant life—the *forms*, so called. Had this book been issued five years hence it is probable that many plants here recorded as varieties under a trinomial would have been placed as forms. The author appears to have just missed publishing an epoch-making work. Notwithstanding its shortcomings the book deserves a place in the library side by side with the standard botanical text books, and is destined to have a large sale. The fernworts in this volume are by Prof. Underwood, and present little change from those in the sixth edition of his "Our Native Ferns."

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

CLUTE, W. N. *Fairy rings formed by Osmunda*. Fern Bulletin, O. 1901.

CLUTE, W. N. *New way of growing Ferns*. Fern Bulletin, O. 1901.

DAVENPORT, G. E. *Notes on New England Ferns.—II*. Rhodora, N. 1901.

DAVENPORT, G. E. *Two new Fern Lists.—I*. Fern Bulletin, O. 1901.

EATON, A. A. *The earliest Fern*. Fern Bulletin, O. 1901.

EATON, A. A. *The Genus Equisetum, with reference to the North American species. Ninth paper*. Fern Bulletin, O. 1901.

EATON, A. A. *Our Western Woodwardia*. Fern Bulletin, O. 1901.

FERNALD, M. L. *The true Lycopodium Complanatum and its common American representative*. Rhodora, N. 1901.

GILBERT, B. D. *Notes on Lycopodium tristachyum*. Torreya, O. 1901.

GILBERT, B. D. *The range of Polypodium Californicum*. Fern Bulletin, O. 1901.

HABERER, J. V. *Two Fern Allies in Central New York*. Fern Bulletin, O. 1901.

HALL, W. F. *Ferns—Varieties and Culture*, illust. Home and Flowers, N. 1901.

HOUSE, H. D. *Dryopteris simulata* in Central New York. Fern Bulletin, O. 1901.

MEEHAN, THOMAS. *Cystopteris bulbifera*, illust. Meehan's Monthly, D. 1901.

PARISH, S. B. *California Fern Gossip*. Fern Bulletin, O. 1901.

PUTNAM, BESSIE L. *Glimpses of Fern Life*, illust. Pop. Science, N. 1901.

WOOLSON, G. A. *A New station for Asplenium ebenoides*. Fern Bulletin, O. 1901.

WOOLSON, G. A. *A Third New England Station for Asplenium ebenoides*. Rhodora, O. 1901.

_____. *Ferns for all Purposes*, illust. Cala. Floriculturist, D. 1901.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—The address of Miss Margaret Slosson is changed to 875 West End avenue, New York City.

—The change in the subscription price of the BULLETIN will not affect members of the Chapter. The dues are as usual, one dollar annually, and the journal is sent free to all members not in arrears for dues.

—The ninth annual report of the Chapter will be issued early in the year. It will contain a revised list of members, including those who have joined the Chapter since the October BULLETIN was issued. Any changes of address should at once be sent to the Secretary.

—The officers chosen for 1902 at the October election are as follows: President, B. D. Gilbert, Clayville, N. Y.; Vice-President, George E. Davenport, Medford, Mass.; Secretary, C. F. Saunders, Philadelphia, Pa.; Treasurer, James A. Graves, Susquehanna, Pa. Mr. Saunders was unable to accept the position of Secretary, and President Gilbert has therefore appointed Homer D. House, 506 University Place, Syracuse, N. Y., in his stead. A full report of the election will appear in the annual report.

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The book is sent postpaid for \$2.35, but to those who care to order it with the *Fern Bulletin* we will send it and a year's subscription for \$2.60. Old subscribers may order it and have their subscriptions extended for one year for the same sum. This offer does not extend to those in arrears unless the arrearage is *also* paid. By adding 50 cents more, making \$3.10 in all a year's subscription to the *American Botanist* will be added. Address.

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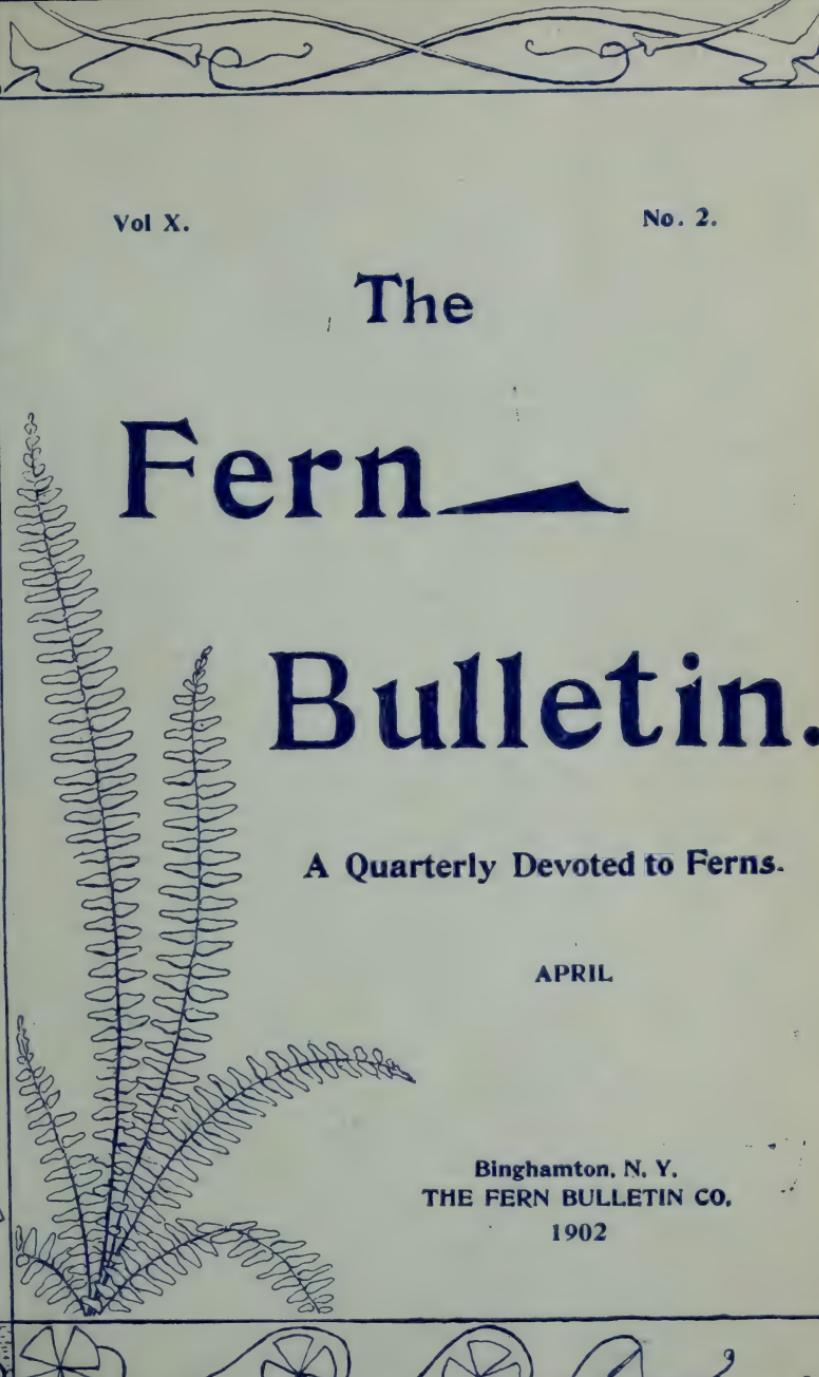
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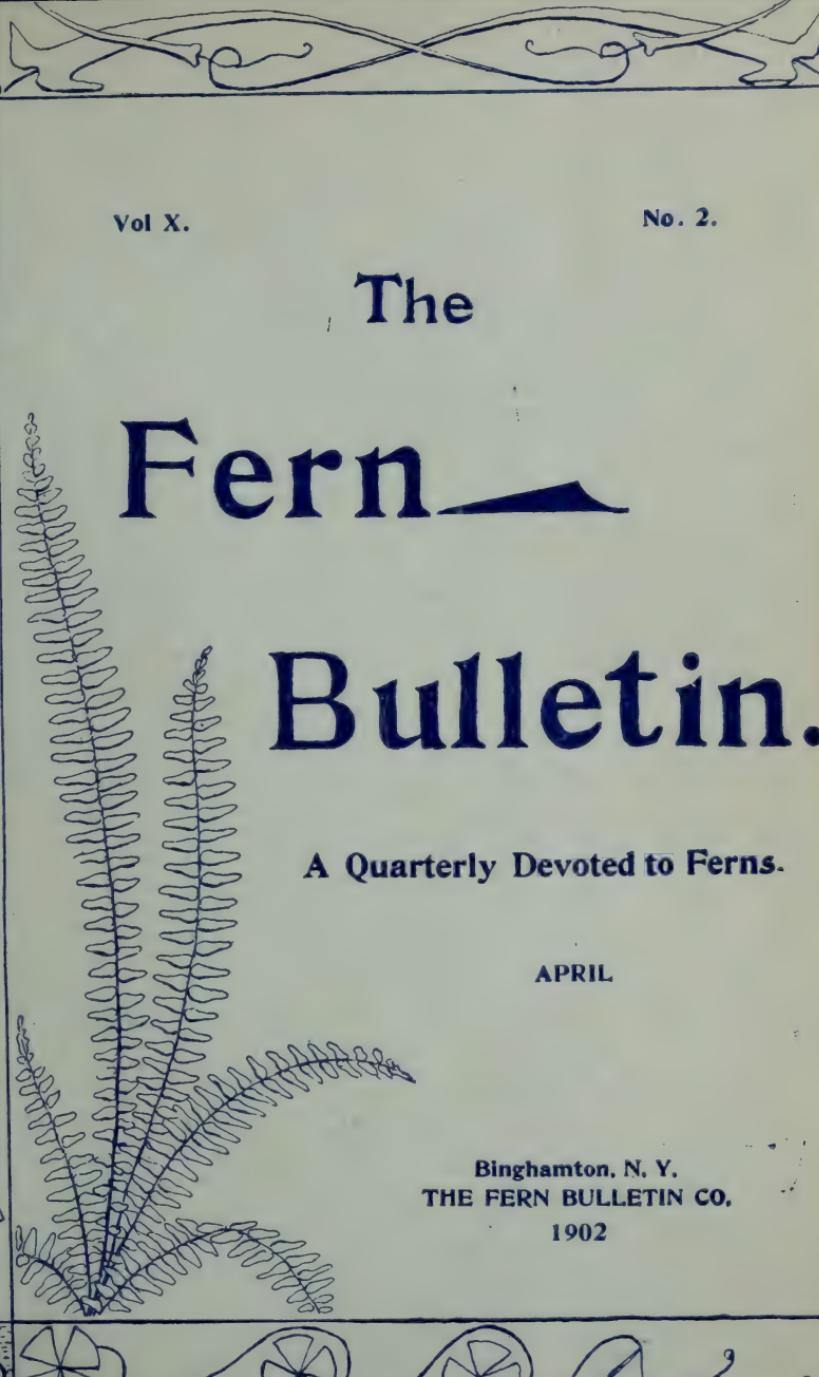


The Fern Bulletin.

A Quarterly Devoted to Ferns.

APRIL

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1902



THE FERN BULLETIN

A QUARTERLY DEVOTED TO FERNS

WILLARD N. CLUTE, Editor

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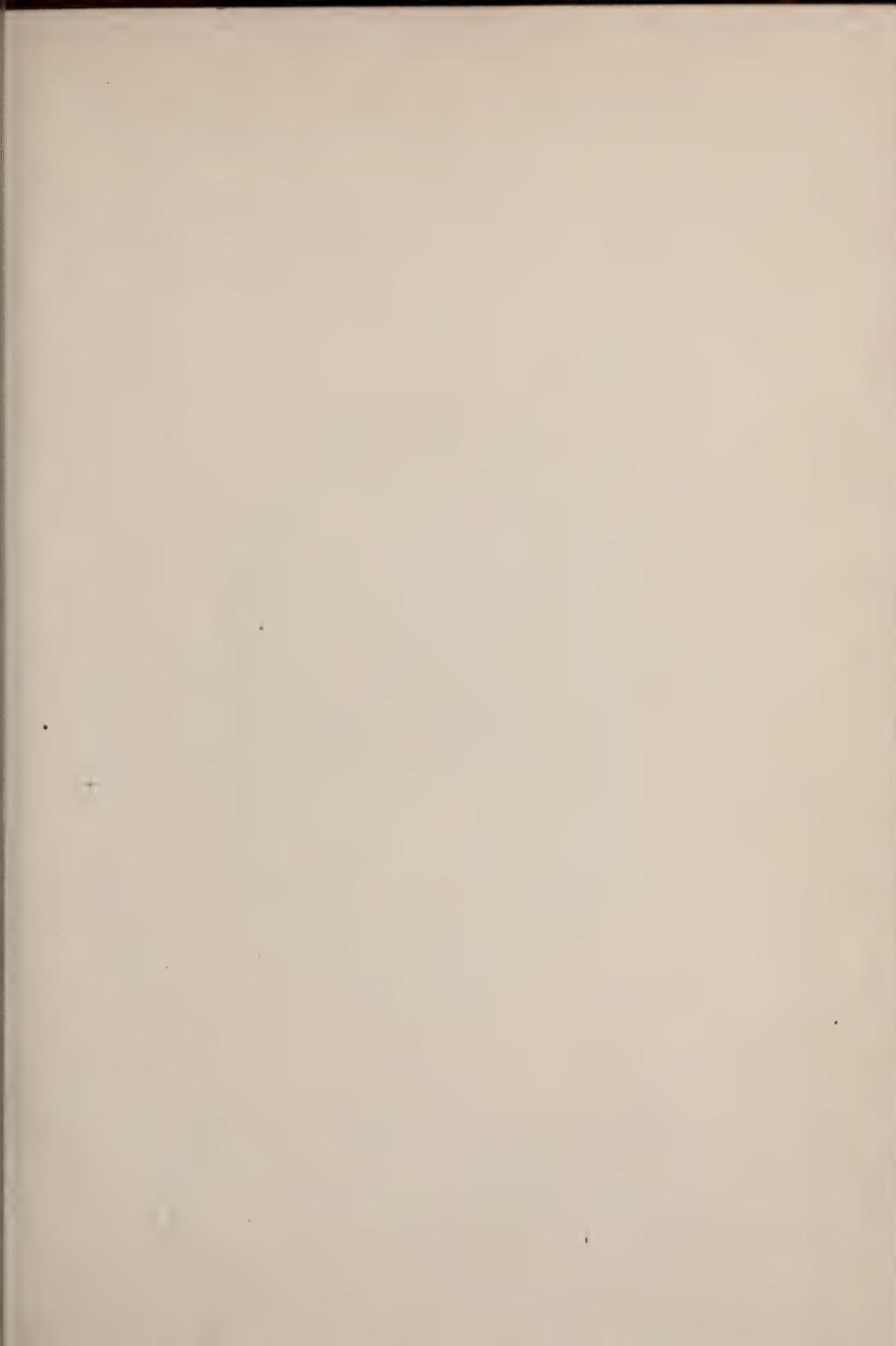
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WANTED—To complete files, Nos. 5 and 7, of Vol. I-III, and No. 1, Vol. IV, Linnaean Fern Bulletin, and No. 1 of Vol. V Fern Bulletin. Any reasonable price paid. O. M. Olson, Fort Dodge, Iowa.

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ALVAH AUGUSTUS EATON

THE FERN BULLETIN

VOL. X.

APRIL, 1902

No. 2.

NOTES FROM THE SOUTH.—II.

BY WILLARD N. CLUTE.

It seems that I shall have to modify, somewhat, the statements made in the January number regarding the fern-flora of this part of the world. While further explorations have not shown the ferns to be any more abundant than at first stated, the catalogues of Louisiana plants and the herbaria of local botanists show that the State is by no means lacking in ferns. But if one does not know where to search for them, he may search long in vain. They are not generally distributed and separate expeditions must be made for different species. For instance, one must go miles beyond the city for specimens of that elsewhere common species, the sensitive fern. Before one can get much of a fern collection he will be obliged to visit the other side of Lake Pontchartrain, where, "in the piney woods," as the expression goes, I am told the ferns and fern allies are fairly abundant. So little, however, is known about the ferns of Louisiana that a list of species with notes seems a desideratum, and it is probable that one will appear in this journal before long.

While I have not yet visited "the piney woods" I have had some very successful collecting trips nearer home and curiously enough have discovered certain species before unknown to grow in the State. Collectors here account for their failure to find these plants by saying that it never occurred to them to go botanizing in a graveyard.

PTERIS LONGIFOLIA IN LOUISIANA.—Last January while rambling through the old "Girod Street Cemetery" I was delighted to find a large colony of this species growing upon the old tombs. For the benefit of those who are unacquainted with the methods of burial in New Orleans it may be said that earth burial is the exception. The watery nature of the soil requires that burials be above ground. The wealthier class is buried in

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separate tombs of brick or stone; but others have less commodious resting places. Around all sides of the cemetery is a wall at least ten feet high, inside of which are rows of burial places, tier upon tier to the top of the wall, like a great set of pigeon-holes, each two feet square. When a burial has taken place the entrance to the pigeon-hole is built up with masonry and it is in the crevices of this work that *Pteris longifolia* has established itself. The plants thrive luxuriantly—too luxuriantly, in fact—for the sexton tells me that if unhindered they cover the face of the tombs and obscure the inscriptions. Several times he has been obliged to tear them down and carry them away literally by cart-loads. It may be questioned whether the species is native to the State or not. I am inclined to believe that it is. While it is possible that the first plants may have arisen from fronds used in funeral decorations, the probabilities are not very great, as this species is rarely if ever used in such work. Girod is the oldest of the "American" cemeteries, and has long formed a congenial home for the species. It is possible that an examination of similar situations will show the fern to be fairly common in the State. I have since found it plentiful in the "Old St. Louis Cemetery," the most ancient of the French burial places. In January the young fronds were fast uncoiling and its fruit must ripen early in the year.

Pteris longifolia comes through the Louisiana winter with many fresh green fronds, though the oldest fronds die by the frost. While changing the driers upon some fronds of this species, a heavily fruited frond attracted my attention by giving out a crackling sound which I found was caused by the opening of thousands of spore-cases. The sound was plainly audible at a distance of two feet, and may be likened to the sound of a heavy storm of sleet beating upon the panes of a distant window. When we reflect how very small the individual spore-cases are, the fact that the noise of their opening and shutting may become audible to human ears is remarkable.

SECOND LOUISIANA RECORD FOR PTERIS SERRULATA.—This species has been recorded from Louisiana by Langlois as an escape, but when a species is not only able to maintain itself in a wild state, but to constantly increase the area it occupies, it is no longer proper to apply this term to it. Langlois apparently found

only one or two specimens, but the colony I have found is well established. The ancient cemetery on Girod Street is also the home of this species. Ferns of several sorts are so common there that I had visited the place several times before I detected *serrulata*, although it grows in great profusion on the north wall exposed to the full rays of the sun for the greater part of each day. *Pteris longifolia* is found most plentifully on the north face of the south wall where it gets the sun for only a few hours in the morning, and *P. serrulata* occupies similar positions facing it. The fertile fronds are numerous and well developed, and the species must be set down as naturalized at least.

ADDITIONAL STATIONS FOR CERATOPTERIS.—Since the publication of my article in the January FERN BULLETIN Prof. R. S. Cocks has very kindly supplied me with further data regarding the "floating fern." Specimens are said to have been collected by Dr. J. M. Joor in 1892, near the spot where I found my specimens, but the fact was never recorded, and the specimens are not now in existence, apparently. Upon the death of Dr. Joor his herbarium went to the Missouri Botanical Garden, but the *Ceratopteris* is not there. If additional evidence that the plant is native to Louisiana were needed to supplement these records Prof. Cocks has abundantly supplied it by giving me several sheets of *Ceratopteris*, which he collected some years ago on the shores of Lake Pontchartrain and near my station for it. These specimens, which he had laid aside without identifying, were rooted in the mud, and so there can be no doubt as to the place of the species in the fern flora of the State. My own specimen is of more than ordinary interest from the fact that the fronds bear a large number of young plants just starting into growth.

THE DISTRIBUTION OF MARSILIA UNCI NATA.—Fruiting specimens of the *Marsilia*, common along the Mississippi in Louisiana, have recently been seen and are unquestionably plants of *Marsilia uncinata*. The species is most abundant about New Orleans, growing on the borders of pools and roadside ditches and Prof. Cocks informs me that it is found along the river for two hundred miles north of the city. It fruits in late May or June, and illustrates the fact that the most luxuriant plants of any species are usually least fruitful, by producing sporocarps only on the stunted plants left on shore by the receding waters.

AZOLLA CAROLINIANA IN WINTER.—It does not seem known at present whether *Azolla* is evergreen in the northern parts of its range or not, but here it remains fresh and green through the winter, through the pools in which it floats may occasionally have a thin coating of ice. The number of specimens does not appear to be as great in winter as at other seasons, and it may be that the species forms resting bodies that sink to the bottom, as other plants do. I have not access to the literature of the subject at present, but hazard this conjecture.

EQUISETUM ROBUSTUM.—The moisture in the soil nearly anywhere about New Orleans renders it a most congenial one for the scouring rushes, and many vacant lots are the homes of *Equisetum robustum*. The plants of this species are so nearly like those of *E. hyemale* in superficial appearance, and the two grow in such exact imitation of each other's habit and habitat that having seen one, the collector can easily imagine the other. There is one point about many of the plants of *robustum* here that distinguishes them from *hyemale* and that is the production of long slender branches. Apparently the plants always branch if the tip is injured, and I think the uninjured ones either branch late the first season or at the beginning of the second. The children have found an unique use for the stems. They place them on the street car track for the pleasure of hearing them explode as the car rolls over them.

PSILOTUM NUDUM IN FLORIDA.—Last December Mr. Severin Rapp, of Sanford, Florida, sent me for identification some specimens of a fern ally which proved to be that rare cousin of the Lycopodium—*Psilotum nudum* or *P. triquetrum*. Later in reply to a request for further information, he wrote that the specimens were found near Sanford, not far from the shore of Lake Monroe which is connected with the St. John's river. They grew upon the trunk of a cabbage palmetto, about a foot from the ground and were in full fruit. In the same locality were specimens of the grass fern (*Littaria lineata*) and the gray polypody. The lists of ferns credit this species to "Southern Florida," but as I have been unable to locate any definite stations, I take pleasure in recording this one. Sanford is about 125 miles south of Jacksonville, in Orange County.

ADIANTUM CAPILLUS-VENERIS.—This species is known to be a native of Louisiana, but apparently no station has been recorded near New Orleans. It is therefore of interest to note that it grows in considerable quantity upon the walls of Girod cemetery.

Is **POLYPODIUM INCANUM** A SAPROPHYTE?—Several notes have recently been published regarding the difficulty experienced in trying to cultivate the little resurrection fern (*Polypodium incanum*). From these it appears that this fern, unlike an orchid, requires something more than a favorable position upon a piece of bark to induce it to grow. The fern is commonly regarded as able to obtain its living entirely from the water and air, but in tearing specimens away from their positions on the trees, I have been impressed with the depth to which the roots penetrate. They certainly go deeper than is necessary to merely hold the plant in place and it seems quite probable that the decaying bark affords a large amount of nourishment to the plant. If so this would account for the decline of specimens when transplanted from their natural habitats.

New Orleans.

THE LOG FERN.

By WILLIAM PALMER.

In June, 1896, at the head of Washington Ditch, in the Dismal Swamp of Virginia, I found a few imperfect fern fronds which I thought at the time might be *Dryopteris cristata Clintoniana*. The following year at the same place I found a few more but none of them perfect. Never having seen Clinton's fern growing I with some doubt concluded my specimens belonged to that sub-species. On June 8, 1899, however, while examining another part of the swamp, about eight miles distant, I found the same fern abundant, growing about the bases of large trees and on huge, partially rotten logs, and at once satisfied myself of its distinctness from the fern mentioned. This view was confirmed soon after my return to Washington, on finding near Lincolnia, Fairfax County, Virginia, on July 9, a large colony of Clinton's fern, and later a small colony near Glen Echo, Maryland. Comparison then of a large amount of fresh material of these two forms, my own and the collection in the National Herbarium,

convinced me not only of their distinctness from each other, but from other species of Eastern North America.

A critical study of its characters and also of those of *Dryopteris goldieana*, two large colonies of which I also fortunately discovered near Washington, showed me the relationship of the two and accordingly I published the plant as a new sub-species under the name of *Dryopteris goldieana celsa*.*

In his sixth edition of "Our Native Ferns," Professor Underwood has cited this name as a synonym of *Dryopteris cristata Clintoniana*, though I sent him a fair series of specimens, and he has even failed accordingly to include the Dismal Swamp as within the range of Clinton's fern! It seems necessary, therefore, to again state the characters upon which I established the sub-species and to compare it with related ferns. The following description is copied from my former paper:

"Structurally similar to *Dryopteris goldieana goldieana* (Pl. I. Figs. 13, 14), but differing in its very erect habit, longer and narrower fronds with smaller and more widely separated pinnae and pinnae, and with the apex regularly decreasing instead of crowded and suddenly shortened. Upper basal pinnules of lower pinnae either absent or very much and usually unequally reduced. Fronds lanceolate or lanceolate-oblong. Stipes at base densely covered with large and richly alutaceous scales with brown centers and transparent, sharply defined margins; upper scales paler and almost unicolor. Type No. 340,398 National Herbarium, Dismal Swamp, Norfolk County, Virginia, June 8, 1899. * * * * Sterile fronds few, much smaller and less elongate. Three lower pairs of pinnae of fertile fronds sterile or nearly so."

Though the outline and superficial appearance of the frond is very similar to one of Clinton's ferns, a close comparison will show great difference. In the *cristata* group the basal pinnules of all the pinnae are the largest and longest, and all these pinnules are opposite, but in the *goldieana* group the basal pinnules of the lowermost pinnae are reduced, unequal, alternate, sometimes absent. In the *cristata* group the scales at the base of the stipe are few, short and pale, rarely dark, while in the other

*Proc. Bio. Soc. Wash., 1899, 65, Pl. I.

group they are large, dense, and highly colored, with very dark centers. These characters at once stamp these two groups as distinct from each other, though these values have been almost entirely overlooked by systematists. From *goldieana*, *celsa* differs in its less herbaceous condition, more erect narrow habit, the greater reduction of the lowermost pinnules, the more widely separated smaller pinnules and less crowded apex.

In the *cristata* group, which comprises *D. boottii*, *D. floridana*, *D. cristata cristata* and *D. c. Clintoniana*, the effort of the pinnae to obtain the greatest amount of light is accomplished by lengthening the rachis between the pinnae, thus obviating the necessity of reducing the size of the lowermost pinnules. In the *goldieana* group, however, the same effort to obtain a maximum amount of light has compelled the lowermost pinnae to turn forward so as to apparently escape the shading of the upper pinnae; in doing so the lowermost pinnules especially the under ones have become reduced or lost and the central ones have become longer so that a reverse condition to that of the *cristata* group has obtained, evidently brought about by the perpetuation and evolution of a simple trait or effort in accomplishing the same result in the two groups by different methods. The similarity of general appearance between *D. g. celsa* and *D. floridana* is due to similarity of ecological conditions, but otherwise they are quite distinct.

That the flexing of a pinnae is caused by the amount of, and direction of the average daily light received by it seems evident. In *D. cristata*, for instance, the pinna simply turns from the frond plane almost ninety degrees, thus bringing its upper surface approximately parallel with the surface of the ground, with usually but slight flexing. The great distance between the pinnae, their shortness and the height of the tall frond are factors which render unnecessary any shortening of the basal pinnules or their alternation. Thus in every specimen examined of the four forms of this group the basal pinnules are the largest and are *always* opposite, the lines of the pinnae tapering to the tip. In *D. goldieana* the basal pinnules for most of the frond are longer than the adjoining, but there is a general tendency for the middle pinnules to be longest. The lowest pinnae have the basal pinnules shorter than those adjoining and they are alternate, not

opposite, as in the upper pinnae, and the outlines of the pinnae are wavy. It is these characters plus the scale characters, the sub-falcate long segments as compared with the blunt, triangular short segments of the *cristata* group, and the lack of triangularity of the lower pinnae which show the close relationship of *goldieana* and *celsa* and their difference from the other group.

The cause of the reduction of these basal pinnules on the lower pinnae seems undoubtedly largely due to the effects of light in flexing the pinnae, the species not being able, as in the *cristata* forms to increase the distance between the pinnae, or rather has adopted a different method in its evolution in adapting itself to similar light conditions. In *celsa* we have an extreme condition of the *goldieana* type which has adapted itself to a greater amount of light and also a greater poverty of root moisture, for as far as known it does not grow in soil. Its pinnules are smaller and wider spaced, the pinnae are smaller and wider spaced, the frond is relatively taller and narrower and the reduction of the basal pinnules is greater, as shown in my specimens and figures. With these characters there is a greater flexing of the lower pinnae and most of their pinnules are alternate. So in the *cristata* group, we find *clintoniana*, *floridana*, and *boottii*, with values in the order named as divergents in different directions from *cristata* and ecologically they have a different habitat.

The great difference between *D. floridana* and *D. g. celsa* show that their evolution has been quite different, but their similarities suggest the ecological values of their environments. The questions involved are largely ones of plant mechanics and require for their solution not only field study, but a large series of specimens of different ages and conditions. The relation between average daily light and root moisture and the movements of the frond parts, both during the life of the frond and the evolution of the species, is similar to the distribution and plane direction of the leaves of a tree where none touch but all occupy definite space, determined as it were by a tacit agreement not to intrude on another's territory. Hence leaves are ecologically comparable with pinnules.

In the following key I have left out the generic and minor characters and have arranged the wording so that the characters given are strictly comparable.

KEY TO CRISTATA AND GOLDIEANA GROUPS.

- A. Pinnatifid or pinnate; *basal pinnae*, triangular, wide spaced; *basal segments*, or *pinnules*, longest and paired; *pinnae*, scaly beneath, outlines regularly tapering, or nearly so; *segments* bluntly triangular, *pinnules*, oblong, both dentate; scales at base of stipe, delicate, pale, comparatively few, rarely with dark centers, (CRISTATA, FLORIDANA, BOOTTII.)
- * Almost wholly pinnatifid, slightly scaly beneath, segments oblique, bluntly triangular.....*Cristata*
- a. Linear lanceolate, few sessile fertile pinnules.....*Cristata*
- b. Broad lanceolate, always pinnatifid, basal segments large.....*Clintoniana*
- * Largely pinnate.
- c. Long obovate, pinnules sessile largely bluntly triangular to oblong, very scaly beneath.....*Floridana*
- d. Lanceolate, pinnules largely oblong, often bidentate, sessile to slightly stalked, slightly scaly beneath.*Boottii*
- B. Almost wholly deeply pinnatifid; *basal pinnae*, ovate, close spaced; *basal pinnules*, above, longest, opposite: below, shortest, alternate, reduced or absent; *pinnae*, slightly scaly beneath, outlines very irregularly tapering; *segments* and *pinnules*, long, subfalcate, obscurely dentate; *scales* at base of stipe, abundant, dense, alutaceous with very dark central stripe, (GOLDIEANA.)
- e. Broad ovate, pinnae lapping; segments, close; apical pinnae crowded; scales alutaceous.....*Goldieana*
- f. Lanceolate, pinnae and segments not close or lapping, apical pinnae not crowded; scales richly alutaceous.....*Celsa*

Washington, D. C.

Though the ground is frozen and it is snowing between bursts of sunshine, the influence of spring is making itself felt about the roots of *Schizaea pusilla* which is now putting up its young croziers. You have to lie flat on the ground and use a pocket lens to see them, for as they make their first bow to the world they are hardly as big as a pin's head. Last year's sterile fronds are as green as ever where they have had the advantage of some covering of snow and the situation is somewhat sheltered. Where the plants have been directly exposed to the elements, the fronds are yellowish or brown.—C. F. Saunders, Schizæland, Feb. 11.

AN INTERESTING JAPANESE POLYPODY.*

BY WILLIAM R. MAXON.

The subject of these notes is a Japanese fern described by Franchet and Savatier as *Polypodium vulgare* var. *Japonicum*.†

Specimens in American herbaria referable to this form agree closely and are so totally distinct from what is known either in Europe or America as *Polypodium vulgare* that any observing botanist, conservative or otherwise, may scarcely question their claim to recognition as a valid species. The type specimens were collected at Ono, a small town on Hondu, the principal island of Japan, and at some locality (not mentioned) on Yezo, the northernmost of the group, usually known as Hokkaido. They are said by the authors to have grown "in rupibus, ad arbores, in silvis regionis submontanae." The specimens to which I have had access are as follows:

- Hakodate (or Hakodadi), Hokkaido. C. Wright, coll. (N, E, G).‡
Sapporo, Hokkaido, 1878. Ex. herb. Sapporo Agric. Coll. (G).
Nanokawa, Tosa, Hondu. August 15, 1890. (G).
Sapporo, Hokkaido. A. W. Stanford, coll. July, 1894. (N).
Yoshino, Yamato, Hondu. May, 1888. (N).
Japan, W. P. Blake, coll. 1862. (E).
Sapporo, Hokkaido, A. W. Stanford, coll. August, 1894. (Y).

From these specimens I am enabled to draw the following description:

POLYPODIUM JAPONICUM (Fr. & Sav.)—Plant usually of small stature, but ranging from 8-23 cm. in height; fronds borne singly from a creeping brownish-chaffy rhizome; stipes 2-5 cm., nearly smooth; laminae usually lanceolate, sparingly glandular, the whole lower surface covered sparsely with long filiform hyaline scales, most noticeable along the rachis and veins; pinnae 12-28 pairs, borne from two to three times their width apart, decurrent on either side at base, 2-3 cm. long, 2-4 mm. broad, tapering gradually at apex, the margins nearly entire;

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†Enum. Pl. Jap. 2:244. 1879.

‡Following Professor Underwood's plan the letters E, G, N, Y, stand respectively for the Eaton, Gray, National and New York Botanical Garden herbaria.

veinlets free, branching 2-4 (usually 3) times, the first branch bearing at its enlarged extremity a single bright-brown sorus; the sori thus borne in two rows of 9-17 pairs, one on either side of the midvein at half the distance to the margin.

The original brief description of Franchet and Savatier may be translated as follows: "The *Polypodium vulgare* of Japan, as we have seen it, is much smaller than the specimens of Europe; the pinnae are more remote, narrower, and often more pointed; the spores are yellowish, rugose, and very finely muricate." The extremely narrow pinnae and presence of the peculiar hair-like chaff serve readily to distinguish the species. Many of the fronds exhibit a marked tendency to coil, the pinnae remaining flat, but the rachis making one or even two sidewise revolutions. The result is very curious. I have seen nothing exactly comparable to it, although the authors mention a similar peculiarity in *P. Nipponicum*, another Japanese species. *P. Japonicum* is said to occur throughout the Empire.

Washington, D. C.

THE GENUS EQUISETUM IN NORTH AMERICA.

By ALVAH A. EATON.

TENTH PAPER.

VARIETIES OF *E. LITORALE*.

Although so diverse in appearance there are no well characterized varieties as that term is generally understood, all forms being readily accounted for by environment alone, and may be produced from one root-stock. In order to present a clear idea of the extremes of appearance, however, it is necessary to give definite descriptions of the extremes of appearance. The gaps can usually be filled, where it is abundant, with a complete set of intergrades. The illustrations of this species have been selected with a view of showing the connecting links, both between varieties and related species.

1. *Humile* Milde. Stem stout, 12-14 angled, decumbent at base, then ascending or erect, branchless, or basal internodes, bearing a few stem-like branches, or with scattered or verticillate

normal ones, 6-15 inches high, often terminated by a yellowish, conical spike, raised from the bell-shaped upper sheath on a stout fleshy pedicel one and one-half inches long. In loose wet sand usually where it has been recently disturbed. The normal fruiting form of the species. Some forms are strikingly like *Arvense campestre macrostachya*. In position where not inundated by the tides, the stomata of this variety are smaller and more numerous, much like those of *fluviatile*, from one form of which (*intermedium*) it can only be separated by anatomical characters. In this form the stem bears many rosulae (flat, circular spots of silex), and the cross-walls of silica are disposed in dots. It has many minor points of difference from true *humile*, and may even be of equal rank. Banks of river at Amesbury, Mass., reservoir at the Pines, Newburyport, Mass., river bank at Bangor and Ft. Kent, Me.: *Fernald*.

2. *Arvensiforme* A. A. E. Stems prostrate or with ascending tip, branched throughout, or with 5-10 naked terminal internodes, lower branches usually longest and often bearing verticils of 2-5 branchlets. Similar to *Arvense decumbens*, which late season forms greatly resemble. In some situations the stems are ascending from base, when they show a distinct dorsi-ventral appearance, lost in pressed specimens.

3. *Gracile* Milde. Stems ascending or erect, 6 inches to 2 feet high, very slender, 5-12 angled, branchless or bearing a few short scattered branches, often terminated by a minute fruit-spike. Dense patches in firm sand of river bank, where inundated regularly by tides: the common form. The bounds of this variety, as of No. 1, have purposely been set wide to include otherwise unclassifiable forms. European specimens of this are much stouter than is usual here, and there are minor differences in sheaths, etc. Amesbury and West Newbury, Mass., Stillwater, Me., *Fernald*; Utica, N. Y., *Dr. Haberer*.

4. *Vulgare* Milde. Stem ascending or erect, usually naked below the 8-12 middle internodes, provided with short, mostly erect branches, of which the middle ones are little if any longer, often terminated by a medium sized, mostly sessile, green or dark brown spike. Dense patches in firm sand and gravel, Newburyport, Mass.; Orono and St. Francis, Me., *Fernald*; Utica, N. Y., *Dr. Haberer*.

5. *Elatius* Milde. Stems erect, 2-3 feet high, naked below, or usually bearing scattered or verticillate long (6-8 inches), spreading branches from near base to middle, terminated by long, slender naked point. In dense patches, often among *fluviatile*, which it closely resembles. In softer and muddier situations than var. *gracile*, into which it imperceptibly passes. Seldom fruiting. Orono and Ft. Fairfield, Me., *Fernald*; Newburyport and Amesbury, Mass., Bull's Island, Pa., *Best*; Safe Harbor, Pa., *Porter*; Winona, Minn., *Holzinger*.

6. *Formosum* forma nov. Stem erect, 8-15 inches high, the lower 3-4 nodes naked, the rest bearing dense verticils of branches 2-4 inches long, decreasing in length from the middle both ways, giving an elliptical outline to the plant. Tip of stems of 3-5 internodes, like one of the branches. Upper border of river at Newburyport and along borders of marsh at Salisbury, Mass. The full developed form of the plant, growing in firm, rich soil where moist, but not often inundated. Passes into var. *vulgare*. Rarely fruited, when the upper branches are longest.

7. *Prolifera* Milde. Small spikes, ending in a few naked internodes. Most common in var. *arvensiformis*, but not often observed.

A variety, *polystachyon*, in which the branches bear spikes, has been found in Europe. I have not met with it only where the first stem has been destroyed to near the base and the resulting branches have borne spikes.

Seabrook, N. H.

[In the first paper on this species in the October (1901) number, page 89, the words *fluviatile* and *litorale* in the eighth and ninth lines from the bottom of the page, should be transposed. Sets of specimens illustrating *fluviatile*, *palustre*, *litorale*, *robustum* and *hyemale* are soon to be issued. For particulars address the author.—Ed.]

In the *Ohio Naturalist* for December, 1901, *Botrychium lunaria* is reported from the vicinity of Painsville, Lake County, Ohio.

NOTES ON AMERICAN FERNS—V.*

BY WILLIAM R. MAXON.

THE CORRECT NAME FOR THE LITTLE EBONY SPLEENWORT.—At plate 222 in the third volume of the "Icones Plantarum," Sir William Hooker described and figured a diminutive South American fern to which he gave the name *Asplenium parvulum*. This was in 1840. Two years later Martens and Galeotti in their well-known "Memoire sur les Fougeres du Mexique" (Mem. Acad. Brux. 15:60. pl. 15. f. 3.) applied the same name to a new species from Mexico which has since been found to have a wide range in our Southern and Southwestern States. Kunze (Linnaea 18: 331. 1844.) soon after called attention to the error of the latter authors in their application of the name to a very unlike plant and properly proposed the name *Asplenium resiliens*. Liebman (Mex. Breg. 88. 1849) seems to have been the only writer to follow Kunze's lead, though it appears certain that the latter name must now be taken up. It is to be presumed that even those who agree to priority of specific names only under the "recognized" genus will hardly protest against writing *A. resiliens* Kunze for *A. parvulum* Mart. and Gal.

PHEGOPTERIS PHEGOPTERIS IN CENTRAL NEW YORK.—Mr. House's observation in the last number of the BULLETIN on the occurrence of this species in Herkimer County, New York, recalls a statement made by Dr. Underwood to me that he had collected it at Cazenovia, Madison County, which is only a very few miles from the exact geographical centre of the State. It has been found also at Unadilla Forks, Otsego County, by Miss S. A. Brown; but it must after all be reckoned a rare fern in Central New York. Its rarity is not easily explained, considering the varying topography of the region, the reported abundance of the species in Northern New York and its occurrence at numerous stations further south which are apparently no more favorable to its growth.

MARSILEA UNCIINATA IN LOUISIANA.—To Mr. Clute's recent note on finding *M. uncinata* at New Orleans, I am able to add an

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additional record for Louisiana. Specimens in the National Herbarium apparently of this species were collected by Mr. C. R. Ball at Alexandria, Rapides County, May 29, 1899; No. 492. The plant is said to be "common; creeping in ditches."

PHEGOPTERIS ROBERTIANA (Hoffm.) A. Braun.—A letter received from Dr. Ascherson, of Berlin, some time ago called my attention to the fact that Hoffman's *Polypodium Robertianum* was first transferred to *Phegopteris* by Alexander Braun in Ascherson's "Flora der Provinz Brandenburg" (1859). The specific name *Robertianum* was applied by Hoffman on account of the fern's faint odor (*odor debilis*) of *Geranium Robertianum*.

ASPLENIUM EBENOIDES.—There remain in my possession a number of reprints of "Notes on the Validity of *Asplenium ebenoides* as a Species," which I shall be glad to send upon request to members of the Chapter who have not already received copies.

Washington, D. C.

HELPS FOR THE BEGINNER.

VII.—THE SCOURING RUSHES.

No sooner does a tinge of green begin to creep into the vernal landscape than the scouring rushes (*Equisetum*) bestir themselves. Almost as soon as the first flowers are blooming we may find on moist warm banks, especially railway embankments, the inflorescence of the earliest of the species which often occur in such numbers as to give a tinge of its own color to the landscape. These sturdy erect spikes of warm flesh color are familiar to the majority of those who have passed a season in the country, though it is possible many have regarded them as curious fungoid growths not to be associated with the more decorative green fronds that later appear in the same places. These early spikes are not really flowers, although they do bear in the cone-like tips a copious supply of green spores from which the new plants eventually grow.

The scouring rushes, or horse tails, as several of the species are called, are built on a very singular plan. The stems are hollow and made up of short joints, one end

of each joint being made to fit into the top of the joint below, while the other is flanged, as we might say, to contain the end of the joint above it. So perfect is this arrangement in some species, that the stems may be pulled apart, joint by joint, and reconstructed again, to all appearances like they were originally. The whole body of the plant—rootstock, stem and branch—is constructed in this manner. To the casual observer the scouring rushes have no leaves, but if one will look more closely at the stem he will see at the point where two sections meet, a circle of tooth-like papery scales which are really leaves but which are apparently of no use to the plant in that capacity; in fact the scouring rushes appear in somewhat the same predicament as the cacti where the stem has to perform most of the duties of leaves.

Our plants may be divided into two sections by the way in which they bear their fruiting parts. In the section to which our earliest species belongs the fronds are annual, and the fertile spikes are often much different from the sterile fronds; in the other the fronds are evergreen and fertile fronds are like the sterile except that they bear a cone of fruit at the tips.

The first species to appear in spring is the field horsetail (*Equisetum arvense*). It is distinguished from all others by the fact that the fleshy fruiting spike dies soon after the spores are shed and is followed by green sterile fronds consisting of a stem and simple branches. The sheaths on the branches have four teeth. A species much less common is *Equisetum pratense*. It resembles the common species very much, but the branches have sheaths with three teeth, and the fertile spikes do not die. After shedding their spores the upper spore-bearing portion dies, while the lower part puts out simple branches like the sterile fronds. When these two species are fruiting, that is in early spring, one may find in moist rich woodlands a third species, the wood horsetail (*E. sylvaticum*), which is quite the handsomest species in the genus, perhaps the handsomest thing that the woodland ever produces. It will be known at once by the fact that the branches are themselves branched and form a series of little green platforms with drooping edges around the stem. The fruit-spikes are at the top of fronds, otherwise like the sterile, and when the spores are shed, the parts which bore them die. A muddy ditch or the shallow margin of a lake or stream is the best place to look

for the water horsetail (*E. fluviatile*). Its stems are tall, slender and wand-like and commonly do not branch until late in spring. The fruiting spike may be found at the top of some of the stems



EQUISETUM ARVENSE—Fertile frond.

about the middle of June. *Equisetum palustre* resembles this, but rarely occurs in the United States. Another plant—*Equisetum littorale*—is much more abundant and is frequently regarded as a

hybrid since its spores are abortive. It is most easily distinguished from the common species by its sheaths which are loose and flaring upwards. Other differences may be found in any botany.

This brings us to the evergreen species. The commonest is the true scouring rush (*E. hyemale*), found on river banks, moist woods and similar places. Its tough stem endures great cold and often the juices in the interior are frozen solid with no apparent injury to the plant. The outer cuticle contains so much silica that the vegetable parts of the stem may be eaten away with acids leaving this glass-like skeleton in its place. It is much like the river horsetail in superficial appearance, but it is much rougher and stiffer, seldom if ever grows in water and rarely branches. *Equisetum robustum* is very much like the preceding species, but as its name indicates, is larger and taller. It is a southern species found from Ohio south and westward. *Equisetum laevigatum* differs from *E. hyemale* principally in being smaller with loose sheaths enlarged upwards. It is much less common. The smallest of the scouring rushes is *Equisetum scirpoideus*, which grows in wet fields, on banks, etc. Its stems are short, slender and tufted and easily overlooked. It fruits early and may be sought at the time the field horsetail spikes are showing. *Equisetum variegatum* resembles this last, but is a more northern species. The minute differences which separate them can be found in any good botany. Both species are evergreen.

Those who wish for further information about the *Equisetums* will find in addition to the instructive series of papers being published by Mr. Eaton in this magazine, an article on *Equisetum scirpoideus* in volume 6, page 25, and one on the field horsetail in volume 7, page 31. From the latter the illustration in this article is reprinted.—*W. N. C.*

In connection with a note on *Pellaea atropurpurea* in the January BULLETIN, it might be well to mention its former occurrence on the walls of an old iron furnace near Glen Burnie, Maryland. This locality is at least ten miles from any limestone and equally far from any other known locality for the fern. Unfortunately the plants were all destroyed by the tearing down of the furnace.—*C. E. Waters.*

NOTES ON THE JANUARY FERN BULLETIN.

By CHAS. T. DRUERY, F. L. S.

OSMUNDA REGALIS WITH DORSAL FRUCTIFICATION (p. 7).—This, from the description, is a very interesting case and merits particular investigation, involving, as it does, so great a structural departure from the generic type as to quite upset the usual definition. It is not stated whether the whole frond was so characterized in its fertile portions or only partially. The resemblance of the frond tip to that of *Nephrodium* is also remarkable.

POLYPODIUM VULGARE ACUMINATUM GILBERT (p. 13).—I should like very much to see a frond of this, as so many *acutum* forms have been found on this side that it would be well to compare before absolutely attaching a new name. In this connection, a remark on page 23, by Mr. Davenport that "it is especially hazardous to propose new varieties of *Athyrium filix-foemina* when there are already upward of 300 or more named forms" applies very pertinently to all species, and I would point out that the frequent references to Mr. G. B. Wollaston and Moore's "Nature Printed Ferns," as authorities are at the present time, quite out of date, the late Mr. Wollaston having ceased, long prior to his death, to take an active interest in nomenclature, while since the publication of the work in question an enormous number of new forms have been found which cannot be left unconsidered. Mr. E. J. Lowe's little book "Our Native Ferns," gives undoubtedly the most exhaustive descriptive list to date, embracing, as it does, nearly 2,000 distinct types, a list which from the general point of view is the more valuable since it deals with all the forms found independently of their decorative value as symmetrical types. The great number, acquired, however, renders the connoisseur dainty on this side, hence a new book, edited by myself, "The Book of British Ferns," is now in the press and will deal descriptively and pictorially and exclusively with perfect forms with the sole exception of some dimorphic ones of particular interest. The undesirability of attaching different names on your side to varietal types which may already exist on this, is very obvious, and is borne in upon me by noting in your previous issues several references to *Asplenium Trichomanes incisum*, which is obviously not the same as the

plumose barren *Asplenium Trichomanes incisum* found here on several occasions and recognized for very many years as the parallel in that species of *P. vulgare Cambricum* in another. The growth of this misleading system would in time result in two conflicting lists of forms of those species common to both areas, which is greatly to be deprecated in the interests of all cosmopolitan fern lovers. Personally I should be happy to give an opinion on any abnormal fronds of species common to the States or Great Britain, and in this way to contribute in some small degree to uniformity. This seems to me to be really the only practical way to decide the question of like or unlike, and I think I may claim sufficient experience to justify reliance on my opinion. The senders, however, would naturally bear the postal outlays incurred, as my correspondence is already sufficiently onerous.

ATHYRIUM AND NEPHRODIUM.—I am delighted to see that these two names are supported by Mr. Davenport and Mr. Gilbert in lieu of synonyms *Asplenium* and *Dryopteris*, against which I have so often protested.—*11 Shaa Road, Acton, London, England.*

ALVAH AUGUSTUS EATON.

Almost from the beginning, the FERN BULLETIN has been frequently favored with contributions from the pen of Mr. Alvah A. Eaton, and we are glad to give to our readers, in this issue, a portrait of the gentleman himself. Mr. Eaton was born at Seabrook, N. H., Nov. 20, 1865. When he was twelve years old the family removed to Salisbury, Mass., and settled upon a farm where the rest of his boyhood was spent. Mr. Eaton was graduated from the Putnam School of Newburyport, taking the four years' course in two years. After teaching school a year at Seabrook, he went to California, where three years were spent in farming and teaching. Returning he was again engaged in teaching, until failing health induced him to take up the business of florist, in which congenial occupation he continues.

Like many of our most painstaking scientists, Mr. Eaton is entirely self-instructed. He takes a thorough interest in all aspects of nature, but botany is his favorite study. He has been so prominently identified with the study of the fern allies, that it will surprise many to know that he is an authority on the flower-

ing plants of his vicinity and has discovered several new species, one of which, a grass, has been named for him. He has studied the mosses to some extent, but the fernworts, especially the genera *Isoetes* and *Equisetum*, have claimed the greatest share of his attention. He has described numerous new species and varieties in these genera as well as in the ferns. He has thoroughly worked up most of the species of *Isoetes* in the world and has spore mounts of a majority of them. His valuable papers on the genus *Equisetum* in North America are well known to readers of this magazine.

Mr. Eaton was for two years Secretary of the Fern Chapter and he has always been an energetic worker for its success. To his initiative is also due the formation of the Chapter Herbarium. Mr. Eaton is unmarried and resides at Seabrook, N. H.—W. N. C.

MINOR INACCURACIES.

It is always safe to be correct even in small details. The January BULLETIN contains several minor errors which are misleading, and as four of them, at least, are connected with my own work, I may be pardoned for calling attention to them:

1. Not seeing the proof of my *Selaginella* paper several errors crept in, two of which should be corrected. On page 9 of the *Synopsis* under the paragraph commencing "Strobiles erect" the clause "Terminal leaf-bristles, etc.," should have formed a separate paragraph co-ordinate with the other one commencing with the same words. At the middle of page 11 the "*S. Wrightii*" should have been *S. Wightii*, there being already an *S. Wrightii* from our own country, and the East Indian plant was named for Mr. Wight, who collected in India.

2. In Dr. Waters' article (page 2), I am cited as "assuming that a hybrid is necessarily sterile." As I never held such a view the assumption did not belong to me and must have originated with the writer. It might be well to add in passing that the status of *Asplenium cbenoides* as a species is not involved in the question. No one, I think, has raised that question, and it is one independent of the origin of the species, so cannot be affected by the question as to whether it is or is not a hybrid. On the latter

point some results of actual experiments will soon be announced which will quite effectually dispose of this vexed problem.

3. In Mr. Gilbert's paper (page 13), I am quoted as saying that I "examined Pursh's specimens at the British Museum." If I said so, which seems scarcely credible, I am at fault, for the place was the Kew Herbarium, where a number of Pursh's plants may be found. So far as I know, none of his plants are to be found at the British Museum.

4. Finally Mr. Davenport (page 23), cites me as supporting Professor Eaton's erroneous conclusion that *Botrychium tenebrosum* is "a weakly developed growth of *B. matricariaefolium*." At least the swamp species of Central New York (Baldwinsville), which I take to be A. A. Eaton's *B. tenebrosum*, has surely nothing to do with *B. neglectum*. The Baldwinsville plant was long confused with *B. simplex* with which it has little in common, but no one who has seen the plant growing ever thought of mistaking it for *B. neglectum*, which also grows commonly in another part of the same town. In June, 1898, I made a trip to Baldwinsville with the express purpose of studying this plant in the field with a view of publishing it as a species, but the season was late and I secured only two immature specimens, so that publication was postponed. During the following summer Mr. Eaton described his species which I recognized as probably the same as the Baldwinsville plant. I am certain that it has nothing to do with *B. neglectum* and no one who ever saw the two plants growing would think of confusing them.—*Lucien M. Underwood*.

SPECIFIC CHARACTERS IN BOTRYCHIUM TENE BROSUM.

In the January issue of THE FERN BULLETIN (X. 1., p. 22) Mr. Davenport tabulates his objections to *Botrychium tenebrosum* as a species. I agree with him perfectly that "difference in time of fruiting and character of its habitat" are not specific characters, and have never so considered them; but they are facts of life history that my critic himself would give in a diagnosis, and would not expect them to be received for more than their value. When he confines his argument to these things, and leaves one to infer that they are the only differences, he shows a surprising lack of candor, as anyone may satisfy himself by reference to my

published views on this species. (Rep. Boston meeting, 25, and FERN BULLETIN VII. 1., p. 7). If characters there set forth are not "sound or acceptable," Mr. Davenport not only creates havoc in the genus, but utterly destroys the value of his most important work upon it.

In a letter dated August 30, 1895, Mr. Davenport writes: "I should place the *Botrychium* that you send to me with *B. simplex*, Hitchcock. The specimens are somewhat immature and unsatisfactory, but such as are frequently found under the conditions which you describe." The specimens referred to are from the type locality of *tenebrosum*. It is because of this opinion that I compared them so carefully with *B. simplex* in the Report of the Boston meeting.

It will be seen by reference to the papers mentioned that this has the vernation of *B. lunaria*, or rather between that species and *simplex*. So Mr. Davenport will have to admit that he was mistaken as to the vernation of *B. matricariaefolium* (*Bull. Tor. Club, Jan. '78*), or that he was over-zealous to prove a point. It will also be seen that I have plants up to 9 inches high (and I may add, every possible size between it and the merest thread, 1 inch long), so it is abuse of the term to call it "depauperate," for *Matricariaefolium* is seldom larger.

I have not had access to Davenport's "Notes on *B. simplex*," but it appears that he recognizes its spores to be strikingly larger than any others in the genus. How then can he account for a "depauperate" plant having spores larger than even that species, while the plant in its natural condition has them smaller? To be accurate, *Matricariaefolium* has spores .308-.396mm., averaging .352mm. closely covered with large rounded warts. *B. tenebrosum* has spores .396-.528mm. averaging .484 mm. finely verrucose. I shall await with interest Mr. Davenport's explanation as to why two specimens of the same species, collected side by side, show such a variation in vernation and spores—characters on which he lays greatest stress, and why the "depauperate" one should have spores over .130mm. larger, and differently marked. There are other points on which I wish to speak, but space forbids; I will say in conclusion that I have collected several thousand specimens of *tenebrosum*, and have seen a quarter acre almost completely covered with *B. Matricariaefolium* several years in succession, so

that my experience with either is not limited; but I have never found a specimen large or small where they met, although have diligently searched for such.—*Alvah A. Eaton, Seabrook, N. H.*

THE SLENDER CLIFF BRAKE ON SANDSTONE.

I notice on page 85 of "Our Ferns in Their Haunts" the statement regarding *Pellaea gracilis* that "there appears to be no record of its having been found on any but rocks of this character"—referring to limestone.

Here it grows abundantly on moist ledges of St. Peter's sandstone—a bed of almost pure sand 75 feet in thickness, outcropping in Southeastern Minnesota and Northeastern Iowa and also in Central Western Wisconsin. The plant also grows abundantly on moist exposures of Trenton (limestone) shales.—*Ellison Orr, Waukon, Iowa.*

[This seems to be the first instance of this species being found on rocks other than limestone. It is also of interest to note that Waukon, Iowa, is about the southern limit of the fern's distribution in the Mississippi Valley so far as known.—E.D.]

NOTES ON SOME COMMON FERNS.

By J. C. BUCHHEISTER.

POLYPODIUM VULGARE.—There is a difference in the fronds of ferns found in the plain and those found in higher altitudes. The chief feature about the mountain specimens is their long "tail"—that is, the fronds end with an acuminate apex of remarkable length, often an inch long. Mostly this tail is covered with sori. Side by side the difference in the looks of specimens of Westchester County, N. Y., and of those of the Catskills is striking. As to their endurance through the winter, not all fronds go through it unscathed. A good many curl up, sideways, the pinnae inverted, and wither. On the other hand, I have found remarkably large fronds at East Chester on low ridges in February, after a severe winter, which were splendid and did not seem the worse for the frost they had endured. These seem to

be old mature fronds. The younger ones curl up at the first frost and die.

CYSTOPTERIS BULBIFERA.—The lower pinnae of this fern, especially of the sterile fronds, are often remarkably long, thus giving to the fronds an unusually broad appearance. This fern is gracefulness itself, the fertile fronds are often three feet long and tapering into a long point with hardly perceptible pinnae; they hang down in dense patches from the limestone cliffs.

OSMUNDA CLAYTONIANA.—Whenever a plant of *Osmunda Claytoniana* in a meadow is cut off by a scythe in July, the rhizome of that plant produces immediately a new crop of fronds and often these are fertile. Thus the spectacle of this fern fruiting in August, and in September and October, too, presents itself. Sometimes the fruiting is not complete, and it happens then, that peculiar fronds, which bear sori on the under part of their pinnae, are found, after the manner of the Polypodiaceae.

New York City.

SCOLOPENDRIUM AND PELLAEA.

BY STEWART H. BURNHAM.

While a corresponding member of the Syracuse Botanical Club, Miss S. E. Cobb sent me in 1892 roots of the two rare and interesting ferns, *Phyllitis Scolopendrium* and *Pellaea atropurpurea*. In regard to the *Scolopendrium*, she said: "The fronds are not fruited. I gathered it just as the fronds were starting, and it has since been trying to grow under my window. I think the poor care it has received here is the cause of its not fruiting, but if you plant in quite rich soil in a shady place I think it will repay your care next season."

It has more than repaid and it has been a house-plant ever since, being brought in-doors as soon as cold weather comes. I placed the roots in a flower-crock and they came on nicely, producing as many as one hundred fronds at a time. Many of the fronds fruit finely; and there is a great tendency for the tips to fork, often two or three times. I get rich wood-earth from near limestone rocks, with small bits of limestone to pot it in. Several times I came near losing it on account of the ravages of scale-insects, but to-day it looks quite thrifty.

In regard to the *Pellaea*: "You may be able to make it grow, still I think you will find it difficult to do so, for it seems to love to squeeze itself in the dry crevices of rocks. In some cases I was obliged to break or pull apart the rocks before I could uproot the fern, and as a rule those who have tried to domesticate this fern have failed."

For a year or so it grew nicely in the same crock with *Scolopendrium*, producing some very beautiful fronds. As it was becoming crowded, it was given a small flower-pot of its own, but it died a year or so after. I have since found this fern, very rarely, about the southernmost end of Lake Champlain, on dry rocks.

Vaughns, N. Y.

PELLAEA ATROPPUREA IN A STRANGE PLACE.

By A. VINCENT OSMUN.

In Tolland county, Connecticut, in the town of Bolton, there is a great outcropping of rock, mostly mica schist, with occasionally transverse veins of limestone and quartz. It is not only the geologist who finds this an alluring place, for the botanist, especially the fern lover, will find here some specimens not common in Eastern Connecticut, at least.

In the early part of last September, while a friend and I were collecting, we found the Walking leaf (*Camptosorus rhizophyllus*) growing in luxuriant patches both on the mica schist and on the limestone. It seemed to be doing equally well on each.

Pellaea atropurpurea, which also is found scattered over the face of this cliff, was growing with apparently the same degree of vigor on mica schist and in the calcareous veins. But that which more especially attracted our attention was the peculiar place in which we found two plants of *Pellaea* growing. It was where the cliff terminated at one end in a few big boulders. At the foot of a short slope which ran from the base of one of these boulders, in a position where dislodged plants could not possibly strike in falling, two perfectly healthy plants of *Pellaea*, both with fronds from ten to fourteen inches long, were firmly rooted in the clayey soil. A scattering growth of poverty grass, *Andropogon furcatus*, surrounded the plants.

Taking into consideration that these plants were well established; that the stubs of a number of years' growth remained, and that the surrounding soil did not appear to have been disturbed for many years, it would seem that they must have grown in this unnatural place, if not from the spores, then from the time they were very young plants.

LYGODIUM PALMATUM IN NEW HAMPSHIRE.

In our study of the ferns of New Hampshire we were told that *Lygodium palmatum* grew in Winchester years ago, and some of our Nature Club remembered of fronds being brought by friends from Winchester some twenty-five years ago. Last year we found it growing on a knoll not larger than ten by fifteen feet, near a brook in a meadow. The soil was black and moist. Several small trees and shrubs with quantities of *Osmunda regalis* grew on this knoll, while an abundance of the *Lygodium*, fruiting beautifully, climbed over all the low bushes. We were told that no one had succeeded in transplanting it from that one knoll, although many had tried it. It was with great difficulty that I obtained any of the roots, they were so intertwined with the roots of the *Osmunda*. The roots we took into the house are still alive, and when the snow covered the fronds out of doors they were fresh and green. I am anxiously awaiting the coming of spring time to see if new fronds will appear.—*Rest H. Metcalf, Hinsdale, N. H.*

A CORRECTION.

I find on referring to Dr. Underwood's 6th Ed. of his manual that he accepts *Botrychium tenebrosum* as a species, so that my reference to his views in my criticism of Mr. Gilbert's catalogue in the January BULLETIN must be withdrawn. I do not quite understand how I could have overlooked this reference, but do not see as the status of the plant itself is in any way affected by it, and, with this correction, my criticism may otherwise stand as published.—*George E. Davenport.*

EDITORIAL.

Editing a magazine at long range is not an easy proposition. The editor found this out in January while more than a thousand miles away. In addition to the usual delays of proof-sheets and copy in the mails, the engraver was slow with the illustrations and it was not until the middle of February that the magazine was sent out. But it will never happen again—not if we can help it! About the second week in January the complaints began to come in, and with each mail the number increased until individual explanation became out of the question and we were obliged to let them accumulate and trust to this note of apology and explanation to set matters right. Unpleasant as the situation was for us, there were certain consoling elements in it, not the least of which was the reflection that the magazine has earned an excellent reputation for promptness. It has never been late before and we trust it never will be again. When it does not appear within ten days after the first of the month in which it is published, we shall consider it a favor if subscribers will notify us.

* *

Without someone close at hand to watch him, the printer occasionally takes unwarranted liberties with the types. In the January number he made the line under the illustration of three fronds of *Asplenium ebenoides* read *Asplenium ebencum*, and by dropping a line out of the third editorial rendered it meaningless. Because of the vast amount of patience he is obliged to exercise in his business the job printer is in the habit of styling himself the Job printer; but there are times when the editor feels that he ought to share in the title and this is one of them.

* *

It is a source of disappointment to many of our readers that they cannot obtain the first five volumes of this journal. The numbers have been so long out of print that all of them sell for a considerable advance upon the original price and even then are rarely offered for sale. We have often been urged to reprint these volumes, but to do so would depreciate the investments of those who have bought at an advanced price and this we are not

inclined to do. These early volumes, however, contain a great deal of matter that is still of interest, and should in some way be made available. Other considerations aside, the cost of reprinting entire would make the publication cost too much; but if only the scientific articles and notes were republished, leaving out everything of transient interest, it is possible that it may soon be accomplished. The matter will make a volume of about 100 pages the size of this. A moderate number of subscriptions at \$1.00 each would be sufficient, and these should be forthcoming since there are many who are willing to pay \$3.50 for the back numbers when offered for sale. All who are interested are invited to address us at once, stating the number of copies they will subscribe for at \$1.00 each. If enough subscriptions are pledged the work will be begun at once. We will also welcome suggestions as to the arrangement of matter in the reprints.

BOOK NEWS.

With the coming of spring, and the turning of attention once more to the flowers of the field, the young botanist will do well to have a look at "A Guide to the Wildflowers"/* before selecting his botanical mentor for the season. One of its chief attractions is the wealth of colored plates by Mrs. Ellis Rowan, well known for her spirited paintings of the wildflowers in many lands. There are 64 of these plates besides 100 others in black and white, in all representing some 200 of the well-known and representative plants of Eastern America. The book contains descriptions of 500 species arranged according to the kinds of soil in which the plants grow. In addition to the scientific descriptions there is more or less matter of an untechnical nature concerning each species. The book is an excellent one to supplement the ordinary "Botany," which is usually too condensed to admit observations not directly concerned with the identification of the plants.

There are certain books that we lay on the shelf until we wish to verify a fact, and certain others that when once begun are not laid aside until the end is reached. Alice Morse Earle's "Old-

*A guide to the Wildflowers, by Alice Lounsberry, New York; The F. A. Stokes Co., 1899. 8vo.; \$2.77.

Time Gardens"† is neither one nor the other, but in a class between. It is a book to be kept near at hand and browsed through and leisurely digested in any idle half hours that may come. As its name indicates, the volume is principally concerned with the gardens of our colonial ancestors, the flowers that grew in them and the quaint facts and fancies about them that have been embalmed in the literature and folk-lore on both sides of the Atlantic. Many an ancient favorite among the flowers comes back to life at the touch of Mrs. Earle's pen, and many pages are redolent of the mints and simples of the old-time gardens. Modern gardens, however, are not overlooked, for the book contains a large number of illustrations made mostly from photographs taken in the finest gardens of America.

The increasing interest in forests and forestry has called forth an excellent little book by G. Frederick Schwarz, entitled "Forest Trees and Forest Scenery."‡ We have had plenty of books on the trees as individual species, but this is the first American book to treat of their esthetic aspects in the forests. The author's style is singularly expressive and well calculated to set forth the beauties of our forest scenery. The book is totally devoid of the Herbarium flavor and reads as if it might have been written in the woods in the presence of the very species mentioned. Various forestry problems are touched upon, but without the usual dry details. Several well-chosen illustrations serve to bring out various features of the work.

One can scarcely claim to know the trees if he can recognize them only in summer dress. In winter, the leafless boughs give an unfamiliar look to the commonest species, and frequently make their identification a matter of difficulty by the use of the ordinary Manuals, so that a book designed expressly for the winter season is very welcome. This we have in "Studies of Trees in Winter,"** a description of the deciduous trees of north-eastern America, by Annie Oakes Huntington. The book

†*Old-Time Gardens*, newly set forth by Alice Morse Earle, New York; The Macmillan Co., 1901. 8vo. pp. 489.

‡*Forest Trees and Forest Scenery*, by G. Frederick Schwarz, New York; The Grafton Press, 1901. 12 mo. pp. 183; \$1.50.

***Studies of Trees in Winter*, by Annie Oakes Huntington, Boston; Knight & Millet, 1902. 8vo. pp. 189; \$2.25 net.

abounds in excellent photographs of trees in winter, and twelve colored plates show the important color-characteristics of the buds and twigs of various species. The text consists, first, of the special features that serve to identify each species in winter, followed by considerable matter relating to their range, habitat, uses and peculiar characteristics. To the rambler the trees are as attractive in winter as in summer—perhaps more so—and this book will be a fitting companion for his excursions during the reign of the frost.

A series of twenty-four plates of representative forest trees, in full leafage, has just been issued by A. W. Mumford, 203 Michigan Avenue, Chicago. These were photographed by an expert photographer and are excellent likenesses which have lost nothing in the reproduction. Each sheet contains three views; the tree entire, a near at hand view of the bark and a leaf or leaf clusters. Under the photographs are several lines of text giving the range of the species, its usual height and girth, the nature of its wood, its uses, etc. The plates will be of much value for use in the school room, but any who are interested in the trees will find this series an excellent one. The price for the set is \$1.00.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

CALDWELL, M. *Native Appalachian Ferns*. Home and Flowers, Ja. 1902.

CLUTE, W. N. *A List of the Fernworts Collected in Jamaica*. Fern Bulletin, Ja. 1902.

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STEELE, W. C. *Fall Fruiting of Osmunda.* Fern Bulletin, Ja. 1902.

UNDERWOOD, L. M. *The Selaginellae of North America.—I.* Fern Bulletin, Ja. 1902.

WATERS, C. E. *A New Form of Osmunda cinnamomea.* Fern Bulletin, Ja. 1902.

WATERS, C. E. *A New Form of Asplenium ebenoides,* illust. Fern Bulletin, Ja. 1902.

THE LINNEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—It is expected that the annual report will be issued some time during the present month. This will contain a list of members including all admitted to the Chapter since the first of this year. It is not yet too late to send in any changes in your address.

—Members of the Chapter who care for specimens of *Azolla Caroliniana*, collected in March, may secure the same by sending a self-addressed stamped envelope to Willard N. Clute, 626 Julia Street, New Orleans.

—Mr. M. L. Fernald has been studying the North American specimens of *Lycopodium complanatum*, and believes that our common form of this plant is not the *L. complanatum* of Linnaeus. The old world form of this species seems to be duplicated by forms from the northern parts of America. This is the true *complanatum*. The common plant of the United States Mr. Fernald calls var. *flabelliforme*. *Complanatum* is reported only from Maine, Montana and Idaho. A description of both forms is given in *Rhodora* for November.

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The book is sent postpaid for \$2.35, but to those who care to order it with the *Fern Bulletin* we will send it and a year's subscription for \$2.60. Old subscribers may order it and have their subscriptions extended for one year for the same sum. This offer does not extend to those in arrears unless the arrearage is *also* paid. By adding 50 cents more, making \$3.10 in all a year's subscription to the *American Botanist* will be added. Address.

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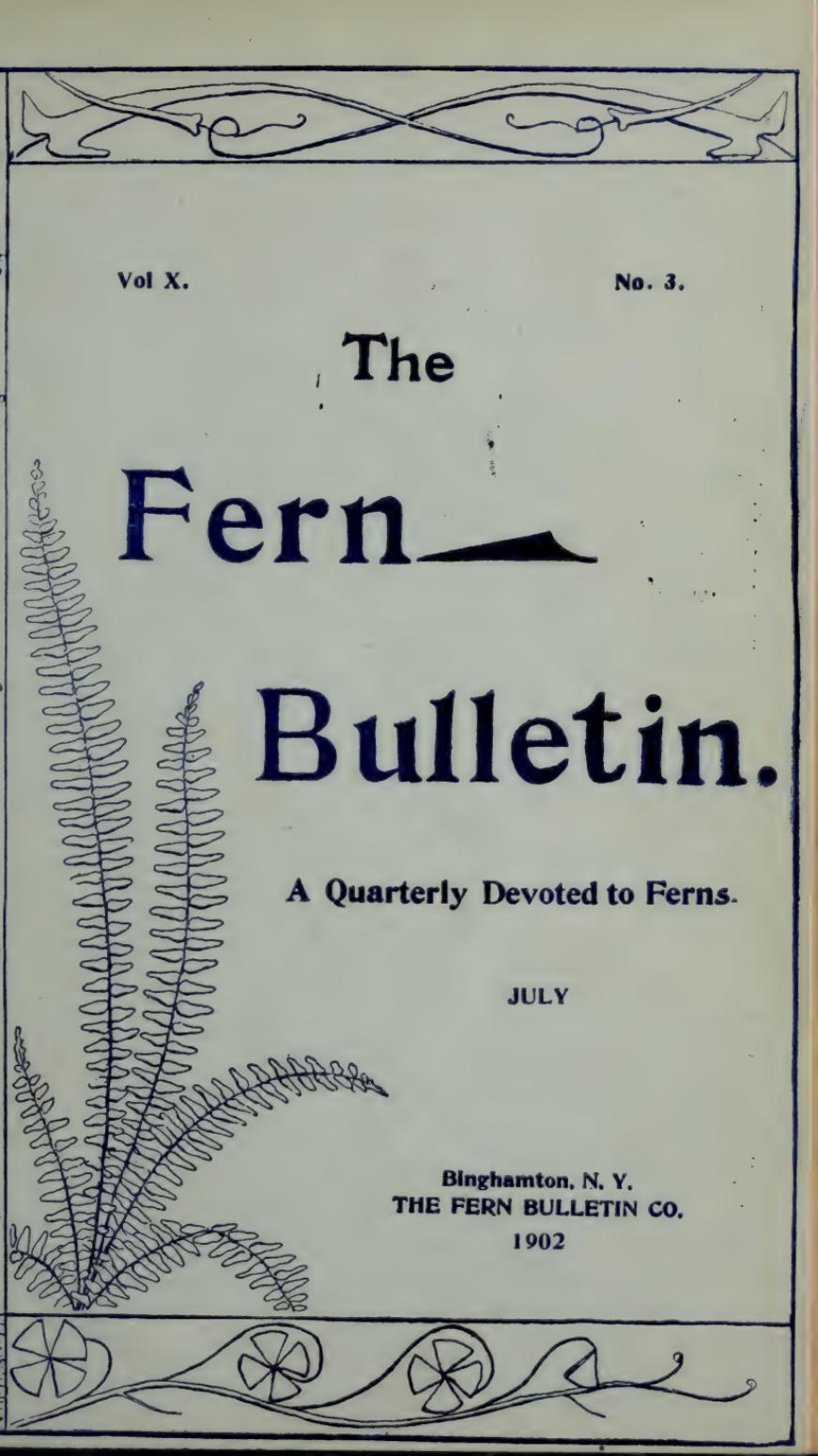


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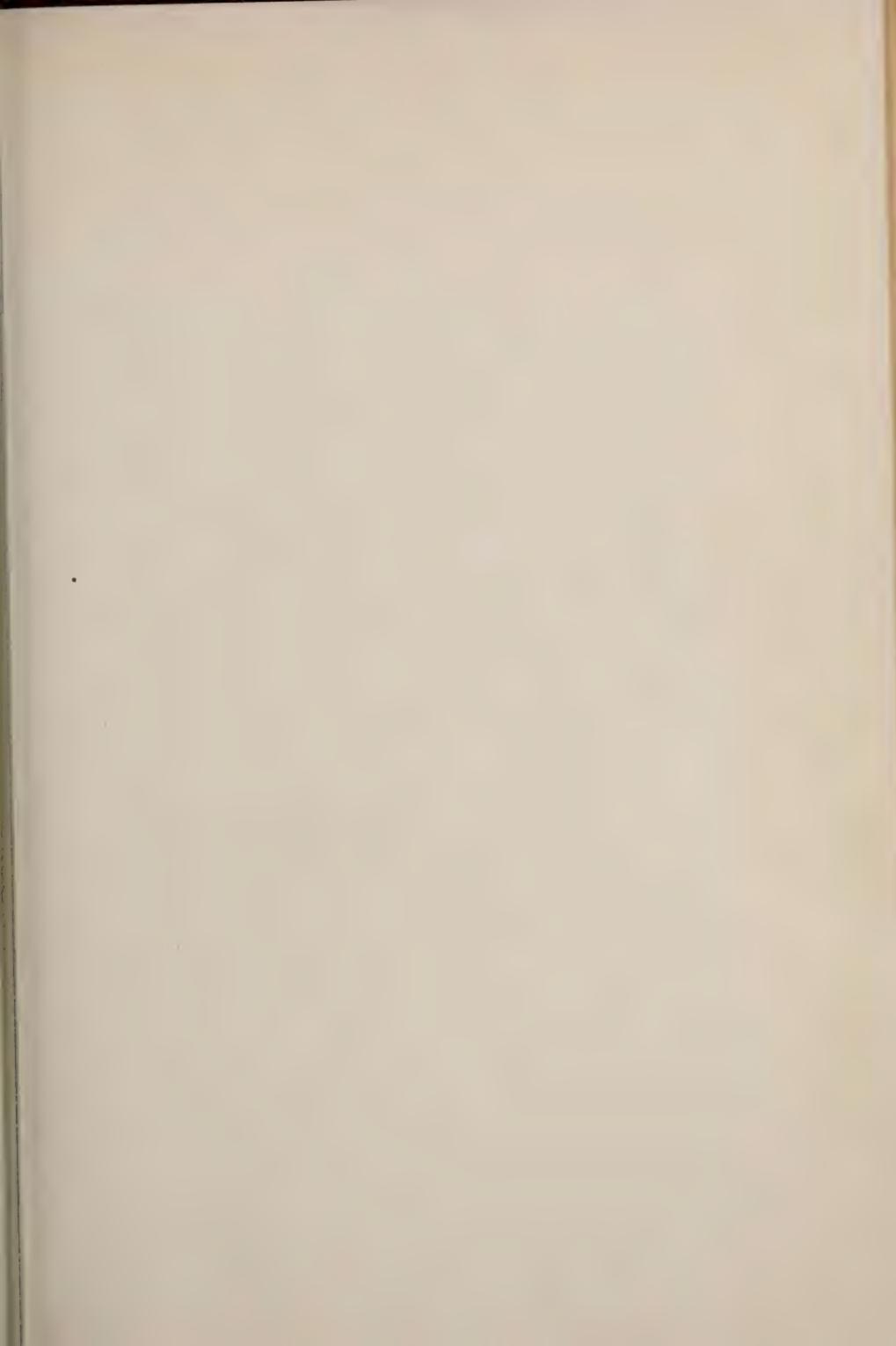
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CHARLES FRANCIS SAUNDERS

THE FERN BULLETIN

VOL. X.

JULY, 1902

No. 3

FERN HUNTING IN NASSAU.

BY E. C. ANTHONY.

The first requisite for a successful fern hunt in Nassau is a carriage with one of the little native horses, which are not beautiful, but willing and untiring. We had a colored driver, who proved on trial to know more about the flora of the island than most of the white inhabitants. The country is entirely different from anything we see in the North. The greatest altitude of the island, in the Baillou Hills, is not more than one hundred and twenty feet, hence there are no streams of fresh water. There are no large forests, and the rough, rocky surface of the ground, almost destitute of soil, makes it seem a poor place for ferns. The roads are very smooth, in many places cut through the solid rock, and where banks have weathered, many little ferns, *Anemia*, *Pteris longifolia*, and *Davallia clavata*, have gained a scanty foothold.

But when we discovered the possibilities of the rock holes our enthusiasm was at once aroused. The rough surface of the ground is filled with holes, from the mysterious Mermaid's Pool in the depths of the pine barrens, which is round, sixty feet across, and in places unfathomable, to those capable of only containing a tiny fern. Many of them resemble wells, being very regular in shape, more or less deep, and often containing water. It was a constant source of pleasure to be on the lookout for these holes beside the road, and eagerly explore them for new specimens. We soon found that as in Florida we must go far and wide to get a variety, for though ferns were abundant, there were rarely more than two or three species in any given locality. We were almost certain to find in the rock holes *Aspidium trifoliatum* and *Dryopteris patens*, with a fringe on the edge of *Davallia clavata*. The large pits, partly filled with brackish water, which is said to rise and fall with the tide, are called ocean holes.

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We drove one day to an old estate where we followed the guide over a rocky path, between bushes of acacia, wild sage, wild guava, and other shrubs, till we came to a low stone wall, where we saw before us an abyss, very deep and wide, the bottom nearly covered with a magnificent growth of *Acrostichum aureum*. Further on we found another place, but a few feet below the path. Here we procured a specimen, which proved to be eight feet in length. The three or four pairs of sharp thorns on the stipe were very evident. There were but six or eight fertile pinnae, and several of the sterile pinnae were bi-lobed. But we were in pursuit of *Adiantums*, and the guide took us first to a spring-hole, very deep, containing good water. On the rocky shelves were *Adiantums* and half a dozen other species, but they were wholly inaccessible. So on we went till we found a pit, not very deep and without water. Here we found *Adiantum tenerum*, *Adiantum melanoleucum*, *Dryopteris patens* and *Aspidium trifoliatum*. *A. Melanoleucum* has become very rare, from the bad habit of the people in pulling it up, for the fragrance in drying. It goes by the name of hay-fern. *Aspidium trifoliatum* is here rarely tri-foliate. We found but one specimen of this shape in the island. Sometimes it is scarcely tri-lobed. On an old wall within the limits of the city we found some starved specimens in the cracks, which were oval, two inches long and one-half inch wide. The edges very wrinkled and ruffled. The venation and fruit alone marked the species.

When we drove through the pine barrens and saw the masses of *Pteris aquilina caudata* we wished that all fern lovers could see the sight. The fronds tower up and droop over the bushes of acacia, like giant ostrich feathers, and were interlaced with the orange coils of the dodder. The bright, glossy green of the leaf, and the polished, straw-colored stems are far more beautiful than our dull gray northern plant. It loses here and in Florida its ternate character. There are six to eight branches on each side of the rachis, which are divided and subdivided. The ultimate pinnules are slender and long, particularly at the end of the branch. Farther away from the road the ground is carpeted with lower *Pteris*, dotted with the pretty pink spires of *Bletia purpurea*. *Pteris aquilina caudata* is found nowhere but in the pine barrens, and the finest specimens of *Anemia adiantifolia* are found there also.

To go into the scrub, as it is called, consisting of shrubs and small trees, one must have a stout knife, to cut one's way through the myriad creepers, which are all thorny and hold one back in the most aggravating way, and not mind torn clothes, nor fear Absalom's fate. Here one may search for *Tacnitis lanceolata*, which is usually found on some small tree, out of reach. But our colored boy is expert at climbing trees, or going down the holes, and he soon brings down a specimen growing with a fine *Tillandsia*, completely encircling the tree. The roots of the two were in a large mass, with a good deal of soil. Where does this soil come from? Can the wind be the only agent? It continually astonished us. The *Tillandsia* is supposed to live on air. Does the fern get its support from the *Tillandsia*?

Phlebodium aureum, which grows so abundantly on palmettos in Florida, seems to prefer stone walls in New Providence. One fine specimen which we found growing with *Polypodium Phyllitidis* on a wall, was as flourishing as were its mates between the stones, on the roots of the trees, and on the ground near by. It looked as though it might have been taken from the ground with the earth and put in its present place, but no one in the island would be capable of that exertion. *Polypodium* was also running on the wall, but with *Hepaticae*.

The total lack of running fresh water accounts for the absence of fern allies. Two small lakes back in the country are filled with brackish water, but are of no interest except to the duck hunter. On the sea coast, a few miles from the city, are the "Caves," so called, where on a dripping rock are fine specimens of *Asplenium dentatum*, which grow nowhere else on the island. Besides some of the roads leading through the island, there are long stretches of *Dryopteris patens*, and where rocks are thrown down, from the walls, *Pteris longifolia* loves to grow, covering the unsightly heap with its long slender fronds. These two ferns are the most common species, growing almost everywhere.

Phegopteris reptans is occasionally found in rock holes. The larger *Adiantum capillus-veneris* is in the deeper holes, and grows very large—almost a bush. All of these ferns, with the exception of *Davallia clavata*, are also found in Florida. There

seems to be no interest among the inhabitants in regard either to ferns or any other of the native plants; even the mysterious Obeah man making no use of them in his concoctions of ill repute.

Gouverneur, N. Y.

SOME FERNS OF THE SIERRA NEVADA RANGE.

BY W. G. WATKINS.

The past year I have made a careful search for ferns in this part of the Sierra Nevada range, taking in an area of country about fifty miles north and south by thirty miles east and west, and have succeeded in locating but fifteen different species. The variations of climate are very great.

In the west and south there is a tropical belt, while to the north and east rises up the summit of the range, covered with perpetual snow. In traveling over the country and viewing the dense growth of vegetation, one would suppose it to be just the place for ferns, but such is not the case.

This country is very rich in general flora and is an ideal field for the botanist, but it is so very mountainous that unless one has been used to climbing mountains and has good staying qualities he will not last long. There are numerous deep and dark canyons that are just the home for rare plants, but one might pass within a rod or two of one of nature's beauties, and never see it. Every yard of ground has got to be explored thoroughly, which takes plenty of time and patience, but these are only trifles for the determined botanist.

Adiantum pedatum is very rare in this altitude, though quite plentiful in high elevations on northern slopes of mountains, always growing near running water and generally on very rough and broken cliffs where the soil is light. I have not found it below 2,000 feet elevation. Where the shade is very dense I have found specimens three feet high and have noticed that the more shade the finer and lighter it seems to grow, making the entire plant much more beautiful. *Adiantum emarginatum* can be found on most all rocky portions of the American river hills facing the north, always on heavy clay soil.

Cystopteris fragilis is very abundant along all streams and small ravines whenever there happens to be a sheltered spot. The pinnae from specimens of very shady location are much lighter and the sori much larger and darker than in exposed places.

Aspidium rigidum, an evergreen fern which seems to prefer shady woods is very plentiful up to 2,500 feet elevation in all soils. Above that I have not been able to find any sign of it. It is a very particular species as to fruiting qualities. Some places I have watched all season but never have found any sign of fruit, while in other localities I have found the sori quite abundant. I have traced *Aspidium munitum* from the valleys in the foothills to 6,000 feet elevation, mostly on northern slopes and very rocky lava or clay soil. In higher altitude it forms a low and compact growth, while lower down it makes a growth of two feet or more with rhizome much stouter and sori much more conspicuous. Its growing season is in winter, but I have found fine specimens at all seasons of the year. *Aspidium Nevadense* might be termed a true water fern, as it can not be found here only along streams and among old drift wood of all sorts. I have collected it from the lowlands to the highest summit along water courses. The variations are very few as to elevation or climatic change; the only thing that I have observed was that the higher altitude produces narrower fronds. They are nearly lanceolate, while below they are much broader with the rhizome somewhat stouter. In all places it rests in winter, renewing activity in April.

I have located *Cheilanthes Californica* in a few gigantic cliffs on the south slope of Little Butte mountain, east of here. It appears to be very rare in this section of country. The soil on the cliffs is lava overlapping the granite. In very warm weather the fronds fold up in a tight ball, and when a cool change comes they come out bright and nice. Its growing period is in rainy weather. *Cheilanthes Clevelandii* is very rare in this part of the State. I have found it only on one cliff east of this place. I find that it folds its fronds in dry weather about as *C. Californica* does. *Cheilanthes gracillima*, a fine little species, is quite plentiful on the face of cliffs, growing with the other *Cheilanthes*; some seasons its fronds fold up, but it takes extremely dry weather to make them change. I believe it will resist as much heat if not more than any of our other Californian ferns.

Polyodium Californicum inhabits moss-covered rocks and I have found it on a few oak trees (*Quercus virens*). I have found this species very widely distributed, having collected it in Southern California and up above here to about 9,000 feet elevation. Climate does not seem to effect any change in its growth whatever. At times I have found it intertwined with *Adiantum emarginatum*, *Woodwardia radicans* and *Aspidium rigidum*.

Pellaea densa is quite rare. I have found it in but one place, growing on the face of a moist cliff on lava soil, facing the south at about 4,500 ft. elevation. It appears to grow through all seasons of the year. *Pellaea ornithopus* is a very widely distributed fern. I have collected it from Southern California to the summit above here 9,000 feet elevation. I cannot see any climatic change in it. In extreme dry weather it changes color turning to a pale green and puts on the appearance of an old broom, while to the slightest touch it will break and crumble as if dead; but just as soon as a cool change comes it will immediately change color to a luxurious green and show sign of life.

Gymnogramme triangularis is a widely distributed species, making its home under some overhanging rock or log, or at times mingling with *Cystopteris fragilis*. The variations of growth are remarkable. On the south slope of mountains most of the fronds are very short, while the pinnae are all run together entirely changing the appearance and making the frond nearly a solid cordate shape; while on the north slope in sheltered places the rhizome is larger and erect, and the fronds form a perfect triangle. This species is also very sensitive to heat, folding and unfolding as the *Cheilanthes* does, and making new growth in winter.

Lomaria spicant is very rare, being a native of Alpine streams. I have not found it below 9,000 feet elevation. It is an evergreen forming new growth in summer.

Woodwardia radicans is very abundant along streams, often attaining seven feet in height. Elevation seems to make no difference to it. I have collected it from 500 feet to 9,000 feet altitude.

Grizzly Flats, California.

THE GENUS EQUISETUM IN NORTH AMERICA.

By ALVAH A. EATON.

ELEVENTH PAPER.

E. fluviatile L.

Rootstock shining, without felt, dark or yellowish brown rarely tuberiferous, with very wide central cavity. Stems erect, 1-4 ft. high, 2-3 twelfths of an inch in diameter at base, naked or variously branched, but always (except in var. 1) with several naked internodes at base, and in the sterile plant at apex also. Basal internodes 1-2 inches long, light or yellowish-green, often flesh-colored, shining, usually wanting stomata: central and terminal internodes light green, slightly 10-30 angled when fresh, more prominently so when dry, the angles rounded on the back and smooth: stomata abundant, irregularly filling the broad grooves, smaller and more elongate than in *E. litorale*. Sheaths appressed, concolorous with the stem, nearly as broad as long, the leaves little elevated, not separated by a commisural groove save in the largest specimens; teeth narrowly lanceolate, rigidly erect, seldom coherent, with rounded sinus and a very narrow white hyaline border, those of basal sheaths usually black or brown, the upper becoming green at base and black at tips. The ribs and leaves increase in number from base upward, the upper internodes usually showing one-third more than the basal. Branches of two kinds; one scattered, 6-8 or more angled, mostly from lower internodes, erect equaling the main stem in height, more properly called secondary stems; the other scattered or in more or less regular verticils, 4-5 angled, 3-8 inches long, at first nearly erect, becoming horizontal below and arching till the tips become erect, their basal internodes always shorter than the stem sheath, their angles low-winged, rough, the grooves with fine cross walls of silex or often sparingly dotted with it; sheaths rigid, the angles green in the middle, joined at the commissures by a white hyaline border; teeth green or black tipped, very sharp, erect or spreading.

ANATOMY.

The centrum occupies four-fifths of the diameter of the stem, the largest of any species of *Equisetum*; vallecular cavities absent save in the lower internodes of the very largest stems, the carinal

bordered with a ring of dark cells; the bast is confined to a small triangle on the keels, the green parenchyma being continuous under the grooves, or in stout stems in mid-season bearing one to several accessory bundles of bast; secondary stems often bearing vallecular holes, though often wanting carinal, the true branches wanting both, the centrum being about 6-8 times as broad as the thin walls.

RANGE AND HABITAT.

In common with all true *Equiseta*, with the sole exception of *E. Bogotense*, which inhabits the cool regions of the Andes, this species thrives in the cold temperate regions of the Northern Hemisphere, being found in America from Virginia to Nova Scotia and Washington, northward to Alaska. It extends across Eurasia in a belt of 15 degrees of latitude, usually common in the northern, but rare in the southern part of its range. Usually growing on a muddy bottom in a few inches of water, it is only accidentally found in a soil that is not saturated. It reaches its finest estate in New England in the partial shade of cedar swamps, growing on the peaty tussocks, often 5 ft. high, with branches reaching 8 inches in length. In low undrained areas it grows in mud amongst tussocks of sedges, and in shallow pools of sluggish streams. It is usually cropped by cattle where they have access to it. Under the above conditions the mud is moderately firm and the plant well branched (*verticillatum*), in deeper pools and looser mud it becomes crowded and unbranched (*limosum*). Unwonted firmness in the soil, as where sand or gravel has been deposited on it by freshets, causes a stunted branchless growth (*uliginosum*). It may be found in all its aspects on tidal flats near the mouth of rivers, above the reach of salt water. Here often in company with *E. litorale*, it covers large areas, either alone or mixed with other vegetation of these localities. It is less common in pools of small streams, being often absent from those emptying directly into salt water, though abundant in all the ramifications of those emptying into large rivers. This is doubtless because in the latter case the plants have spread directly by root division, but contiguous streams have not been stocked because it is so difficult for the plant to spread by spores.

VARIETIES.

No varieties, in the common acceptation of the term have been noticed of this, or any other of the true Equiseta with the exception of variety *boreale* of *E. arvense*. Numerous forms and freaks have, however, been noted, of which I have seen the following from America:

1. *Intermedium* A. A. Eaton. Stems short, 3-8 inches high, decumbent at base, rarely erect, bearing a few basal branches, or with the 3-6 lower internodes bearing verticils of 2-6, these again rarely bearing branchlets; upper 2-6 internodes naked, ending in a normal spike. Flats on banks of Merrimac river at Amesbury, Mass. Caused by a deposit of 6-8 inches of sand by freshets: in and about little pools of water.

This variety grows among *litorale* and was at first taken to be a fertile form of that species, as it greatly resembles var. *humile*. It can be separated from that variety only by taking sections of the stem. It will then be seen that this has thin walls and no vallecular holes, while the other has thicker walls and vallecular holes. The sheaths of this are a little shorter and tighter than the other, the stomata narrower and more numerous. It has persisted unchanged in this locality for five years.

2. *Uliginosum* Muehl. Stems slender, 9-11 angled, naked or rarely branched, usually all sterile. Not sufficiently distinct from the next. Described from plants collected in Pennsylvania by Muhlenberg. It grows usually on hard, often gravelly soil. Uncommon. Gravelly river banks. Ft. Fairfield, Me. *Fernald*, shores of Merrimac at Amesbury, Mass.

3. *Limosum* (L) Gilbert. (var. *Linnacanum* Doell). Stems naked or with a few secondary stems at fruiting time, often developing a few true branches in the upper internodes after decay of the fruit-spike. Deep mud, where inundated by the tides. Merrimac river, Newburyport, Mass., and very common elsewhere in similar situations. Originally described as a species by Linnaeus, but as the next form precedes it in Species Plantarum that retains the name. I am not certain if Mr. Gilbert is the first to print it as a variety of *australe*.

4. *Verticillatum* Doell. Stems bearing more or less regular verticils of branches: the typical form of the species appearing

under three aspects as follows: (a) *brachycladon*, Doell. Verticils few, usually of few short erect branches in the upper part of the 8-11 angled stem. Open pools and bogs, in rather firm soil. (b) *leptocladon*, Doell. The largest form of the species, usually growing in deep swamps in a few inches of water. Stems 3-5 feet high, naked for 1 or 2 feet, the lower internodes without stomata, yellowish or flesh-pink, bearing 12-15 regular verticils of branches 3-8 inches long, those of the middle verticil longest, the sterile stem with a long naked tip, the fertile bearing a sessile spike that matures after the branches have developed. (c) *Attenuatum*, Milde. Like sterile of a and b, but bearing a small spike at the tip of the long naked portion. A partial transition of the sterile stem.

5. *Polystachyum*, Bruck. Like No. 4, but upper branches ending in small spikelets. A late form that is apparently quite rare. I have seen but one specimen, collected by Flett at Tacoma, Wash.

MONSTROSITIES.

Of these I have seen three; two of the fertile and one of the sterile stem. (1) *Proliferum*, Milde. Spike bearing a few naked internodes at top. The sterile tip is at times 2-3 inches long. Quite uncommon, an acre rarely yielding more than a dozen. (2) *Distachyum* Milde. Bearing two spikes in series, with a short internode between. Rare. (3) *Monstro-spiralis*, This is a form that has been found in several of our native Equiseta and in some Hippochaetae I have seen it in *arvense*, *litorale palustre*, and *hiemale*. Sheaths continuous for some distance, encircling the stem in a spiral.

Seabrook, N. H.

GEORGIA FERNS.

By B. D. GILBERT.

The past winter and spring were unusually cold in the South as well as the North, and vegetation was delayed a week or ten days longer than common. Consequently when I went out into the country around Savannah, Ga., on April 4, the ferns were only just beginning to be distinguishable. The woods about there are chiefly composed of water oaks and short-leaved pines.

The soil is sandy and ferns, with the exception of *Pteris aquilina*, all seem to grow in moist places. The four commonest ferns were *Osmunda cinnamomea*, *Woodwardia angustifolia*, *Pteris aquilina* and *Athyrium filix-foemina*. Most of the *Athyrium* was the variety *rubellum*. There was also some *Woodwardia Virginica*, *Asplenium ebeneum* and *Osmunda regalis*. In the clumps of *O. cinnamomea* which produced fertile fronds, some of them were already 3 feet high, while the sterile were only 2 feet. The sterile fronds often had red stems which were not at all woolly, and if these characters continue throughout the season, they might be sufficient to constitute a new variety. *Woodwardia angustifolia* had sterile fronds a foot or more tall, but there was as yet no sign of fertile fronds. The young fronds as they began to unfold were quite pinkish. It grew more plentifully than any other fern seen. *Asplenium ebeneum* grew both in dry and in moist places. Its fertile fronds remained through the winter and stood upright among the freshly started sterile fronds. On one of the old abandoned plantations there was an engine under a shed. The door of the boiler was about 2 feet above the ground, and there was an iron shelf in front of the door about a foot wide. This shelf or hearth probably had some wood ashes left on it when it was abandoned, and this little *Asplenium* had found a lodgment there and now covers the whole length of the hearth, about two feet.

The city of Savannah is supplied with water from artesian wells. These are found also at different points about the country. One of these spouters exists in the middle of a large field about four miles from the city toward the Isle of Hope. Of course the ground about it is now marshy and here *Woodwardia Virginica* has taken up its abode in large quantities. The young fronds are beautifully pink, but as they increase in size the pink color retreats toward the edges and forms an extremely pretty border to the bright green lamina of the pinnae.

The only ferns which showed any fruit were the last year's fronds of *Asplenium ebencum* and some of the largest fronds of *Athyrium filix-foemina rubellum*.

BOTRYCHIUM TERNATUM AND OBLIQUUM.

BY WILLARD N. CLUTE.

In my book "Our Ferns in Their Haunts" I followed Professor Underwood, though with some misgivings, in calling our common ternate grape fern *Botrychium obliquum*. Recently, however, through the kindness of Mr. K. Miyake, I have been supplied with an abundance of the true *B. ternatum* from widely separated stations in Japan, which thoroughly convince me that our species and the Jananese one are not identical and I shall continue to write the American species as *B. obliquum*. The true *ternatum* differs from the American plant in having thinner, more deeply cut pinnae, with the tips of the pinnules more pointed. Both the pinnae and pinnules of the Japanese plant are on longer stalks and except for the fact that the fruiting portion rises from the base of the plant has much the general appearance of *Botrychium Virginianum*. A specimen collected at Tokyo in February shows very plainly the effects of the frost, and it is apparently not as hardy as our own species, as might be inferred from its thinner fronds.

Concerning the name of *Botrychium obliquum* it may be said that while this is applied to what is very plainly the dominant form of this *Botrychium* in Eastern America, the first name applied to the plant is *Botrychium dissectum*, Spreng., because Sprengel happened to get hold of a dissected form and named it first. If, as I firmly believe, the one plant is but a variety of the other, or at least, no more than a sub-species convertible under certain conditions to the normal form, then according to the rules and regulations *Botrychium dissectum* Spreng. would become the type and *B. obliquum*, Muhl. a variety of it. In the same way Mr. Gilbert's *B. ternatum Oncidense* would become *B. dissectum Oncidense*, or as I should be inclined to put it *B. d. obliquum f. Oncidense*. I would also make *B. obliquum intermedium*, Underw. a form of *B. dissectum obliquum* and would write *Botrychium occidentale*, Underw. as a form of *Botrychium dissectum*, Spreng.

Fortunately, however, so many botanists will continue to insist upon the specific distinctness of *B. obliquum* and *B. dissectum*, that these changes are never likely to be made. For

myself, I prefer to call the widely distributed plant *B. obliquum*, making the dissected form a sub-species, and *Oneidense*, *Occidentale* and *intermedium* forms of *obliquum*, regardless of the anachronism which such a proceeding involves.

CHARLES FRANCIS SAUNDERS

Among present day writers on botanical subjects, there are probably none more popular than Mr. C. F. Saunders, whose portrait appears elsewhere in this issue. The contributions that have gained him this success are not of the species-making order, but rather are concerned with every day plants about which Mr. Saunders always manages to find new points of interest that are described in a very felicitous manner.

Mr. Saunders was born in Bucks County, Pa., in 1859, and graduated from Friends' Central High school, Philadelphia, in 1875. After graduation he entered the office of a prominent shipping firm in Philadelphia, with which he has continued ever since. About ten years ago his interest in botany was awakened by attendance upon a course of lectures given by Dr. Joseph T. Rothrock, and since then most of his leisure has been devoted to studies of plants in the field. He has made numerous excursions to points of botanical interest in the Eastern States, and the writer recalls with pleasure a trip with him by wagon through the wildest part of the New Jersey "Pine Barrens," an account of which Mr. Saunders published in the "Proceedings of the Academy of Natural Sciences of Philadelphia" for September, 1900. Another delightful excursion was a several days' tramp with him about the numerous small glacial lakes in northeastern Pennsylvania. Although he has never striven to discover new species, Dr. T. C. Porter has honored him by giving his name to a variety of *Eupatorium*.

During several years Mr. Saunders' contributions have appeared in nearly all the botanical journals that publish articles of a popular nature, while the general press, especially the *Churchman* and the *Philadelphia Record*, have also contained much of his work. His contributions to the FERN BULLETIN have been both numerous and valuable, and this journal is glad to count him among its staunchest friends.—*W. N. C.*

A NEW FORM OF NEPHRODIUM THELYPTERIS.

By A. A. EATON.

Last July I received from Mrs. J. J. Puffer some sterile fronds of *Nephrodium Thelypteris*, collected by her at Sudbury, Mass., that were all forked at the end for $\frac{1}{8}$ — $\frac{1}{2}$ the length and many or all of the pinnae cristate, ending in 1-5 points. At the time no fertile fronds were found, but at my suggestion she visited the locality later, and was successful in procuring some, even more beautifully cristate than the sterile.

In honor of the discoverer I propose to name it *Nephrodium Thelypteris* forma *Pufferae*. Stipe and rachis as in the species, except that the latter forks $\frac{1}{8}$ — $\frac{1}{2}$ its length, the divisions often again forked, pinnae cristate for the outer third into 2-5 crowded, spreading, overlapping divisions; segments at times normal, but often reduced to mere points; at times the rachis is winged without lobes, and again some are much elongated and variously bent, or even greatly enlarged and pinnately incised.

Mrs. Puffer writes as follows: "The whole group, consisting of many plants crowded closely together, occupy a space of some five or six feet in length by two in width, and are growing by the side of a stone wall on the slope of land near a meadow, but they are quite above the water-line. They are almost without exception either forked or tufted. The longest fronds grew up into a bush and were erect, but most of them lie upon each other so they are broken and torn by contact. They are exposed to the full sun all day." Mr. C. T. Druery informs me that this is a very interesting variety, inasmuch as it is the first break this species is known to have made."

THE EARLIEST FERN.

By E. J. HILL.

Under this caption in the FERN BULLETIN for October, 1901, Mr. A. A. Eaton seeks information regarding the first fern to start in spring. My experience confirms his, that the priority is due to *Pellaea gracilis*. I was at the station where they grow at Lemont, Ill., April 10th, 1902, and found them coming up freely. Some were nearly two inches high, and they were in all stages

from this down to those just peeping out of the ground. Well formed pinnae were already present. The ravine where they occur runs nearly north and south, and the ferns grow on both sides on rocks with both east and west exposure. *P. atropurpurea* grows on many ledges of the neighborhood. On these the crosiers had just started, but so tiny as to be hidden in the abundant tomentum at the base of the tuft. They were yet without color. *Cystopteris bulbifera* grows with the *P. gracilis*, but there was no trace of green in it. The old stems hung limp from the ledges.

Chicago.

HELPS FOR THE BEGINNER.

VII.—THE WOOD FERNS.

Not all the ferns that grow in woodlands are wood ferns in the sense that the botanist uses the term. In his lexicon the wood ferns are all members of one family which is dubbed *Nephrodium*, *Dryopteris*, *Aspidium* or *Lastrea* according as the taste of the individual varies. A great many Americans have been brought up to call them *Aspidiums*, but now that it has been decided that this term must go, *Nephrodium* vies with *Dryopteris* for the honor of representing this important family. *Dryopteris* undoubtedly has a clear title so far as priority is concerned, and I might possibly use it if writing only for Americans; but the FERN BULLETIN goes quite around the earth, and as custom has made *Nephrodium* familiar in all parts of the globe, I think it best to adopt the latter name.

To find out whether your specimen is a wood fern or not, look on the under side for the fruit dots. If these are roundish and covered, when young, by a kidney-shaped or heart-shaped indusium that is attached to the frond by the sinus, you may be sure you have made no mistake.

The nearest piece of woodland in eastern America will probably yield specimens of the marginal shield fern (*N. marginale*. Fig. 2). It is easily known by the fact that it bears the large button-like fruit-dots close to the margin. In vigorous specimens the pinnules are often lobed and when in fruit appear as in Fig.

4. Goldie's fern (*N. Goldicanum*, Fig. 3.) greatly resembles the preceding species, so much so that a recent European writer has classed them both as varieties of the old world *N. filixmas*. That they are very different may be seen from the illustration, for the pinnules of *Goldicanum* are not separate on the midribs. The fronds are also thinner and larger and I may add scarcer, while the fruit-dots are not so near the margins.

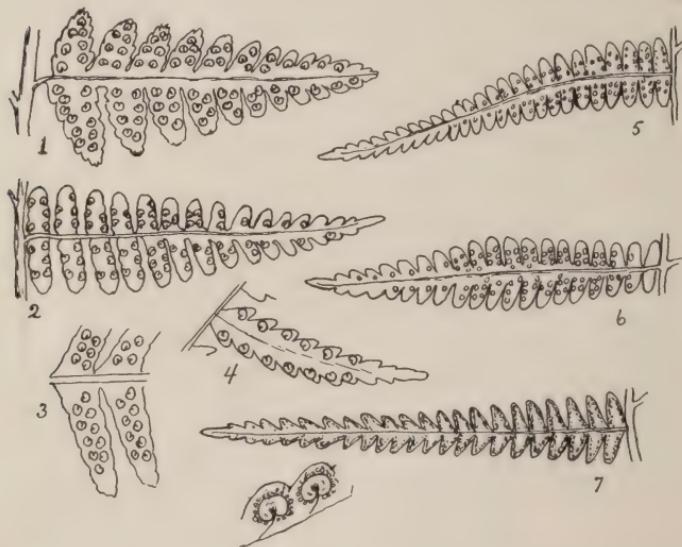


Fig. 1, Middle pinna of *N. cristatum*. Fig. 2, same of *N. marginale*.
Fig. 3, pinnules of *N. Goldicanum*. Fig. 4, a pinnae of *N. marginale*.
5, middle pinna of *N. noveboracense*. Fig. 6, same of *N. simulatum*. Fig. 7,
same of *N. thelypteris*.

In wet woods, or on the borders of swamps, and in many other moist places, one may find the crested fern (*N. cristatum*, Fig. 1.) It may be distinguished by its erect fertile fronds, prostrate sterile ones, by the large sori and by the pinnules of fertile fronds being usually set upon the rachis, like slats in a half open blind. The fertile fronds are long and narrow. *N. Bootii* is something like this species, but the fronds are broader, the sori smaller, the differences between sterile and fertile fronds not so

pronounced, and last, but not least, the pinnae are cut entirely to the rachis and the larger pinnules deeply lobed and toothed.

In dryish woodlands one of the commonest species is the New York fern (*N. Noceboracense*, Fig. 5.) Toward the base of the frond the pinnae become successively smaller until the lowest are mere green lobes. This single feature settles the case of the New York fern. Out in the swamps, in fact, wherever there is moisture, the marsh fern (*N. thelypteris*, Fig. 7.) may be found. It looks much like the New York fern, but the frond is broadest near the base, and the stipes are much longer, often 12 inches or more. The fertile fronds are produced rather late in summer, and the pinnules are rolled back over the sori in such a way that they have a pointed appearance. The fruit-dots are usually very numerous.

Fig. 6 illustrates a pinna of *N. simulatum*, a fern which has not long been known, probably because of its close resemblance to two common species. In everything it seems about half way between the two. The fronds are much like those of *thelypteris* in shape, but like those of *Noceboracense* in habit. It will be noticed that the pinnae are broadest near the middle, the sori are larger, and the pinnules are not revolute. It is found usually in deep shady swamps. It may always be distinguished from *thelypteris* by the fact that the veins are not forked.

The commonest of the wood ferns is the spinulose wood fern (*N. spinulosum*) and its varieties *dilatatum* and *intermedium*. The type is not common in America, but *intermedium* makes up for the lack. *Dilatatum* is a mountain form, plentiful in most elevated regions. It may usually be separated from the others by the shape of the lowest pair of pinnae in which the secondary pinnae on the lower side are very much longer than the rest. The fronds of the *spinulosum* group are much more deeply cut than those of the other wood ferns, being often three or four times pinnate. To distinguish the group from the others is much easier than separating the forms. When in doubt one should consult the books—and the more books, the better, or, rather, surer.—*W. N. C.*

PELLAEA ATROPERPUREA AN EVERGREEN.

By E. J. HILL.

In *Rhodora* for March, 1902, p. 54, Mr. Davenport notes that this is doubtfully an evergreen in New England. It is plainly one in Illinois. I observed them April 10th, this year, at various places on the ledges of limestone at Lemont and Lockport, and found that the greater part of the stems had survived the winter and were still fresh. The pinnae on some tufts in the most exposed positions, as well as in individual stems among those still green, were brown and withered. They were generally adherent, but some stems were naked. Herbarium specimens collected in these localities May 24th, 1899, and June 29th, 1898, have old stems mixed with the new, some of the sori still remaining under the recurved edges of the pinnae. New fronds had in the most vigorous examples reached the height of nearly a foot at the latter date, the fruit dots well on their way. It is possible to obtain the ripened fruit of a preceding year at the time one gets some rather immature of the current year. *P. atropurpurea* is as much an evergreen in this vicinity as the Christmas fern (*Polystichum acrostichoides*).

Chicago.

NOTES FROM THE SOUTH—III.

By WILLARD N. CLUTE.

SELEGINELLA LUDOVICIANA.—So little is known about this species that a question has always existed as to its distinctness from *S. apus*. In the vicinity of New Orleans it is not an uncommon plant, and the several opportunities that I have had for studying it convinces me that it is fully entitled to specific rank. It was originally discovered at Covington, La., by Drummond, and I have seen it growing at Pearl River, some miles from Covington, as well as at Ponchatoulas, thirty miles or more north of New Orleans. It usually occurs in shady spots in the sand barrens and may be distinguished from *S. apus* at a glance by the principal stems which are stiffly erect. It begins to renew its growth about the end of March and for a time the new branchlets are slightly drooping. Prof. R. S. Cocks has presented me

with fine fruiting specimens collected at Mandeville, La., in May. It apparently does not fruit until about the middle of that month. Unlike *S. apus*, the stems, which are occasionally decumbent, produce roots only at the base and lower parts. *S. apus* grows in the same general region but has the same creeping habit as it does further north. I have also fine specimens of it collected in Mississippi that are as closely creeping as any I have found in New York, which shows that the difference in the two forms is not chargeable to climate as Prof. Underwood suggests in the 6th edition of "Our Native Ferns." *Sclaginella Ludoviciana* is a much larger plant than *S. apus*, and so rigid that when the branches wilt after the plant is pulled up, their weight is not sufficient to bend the principal stems.

USE OF THE COMMON WOOD FERN.—The dealers in bouquets do a lively business in New Orleans in winter, for flowers are cheap and easily grown. The greenery that is mixed with the flowers, however, is not so readily produced it would seem, for a northern fern, no other than our common wood fern (*Nephrodium spinulosum intermedium*), is the principal thing used. Since this fern is not known to grow south of Tennessee, I had the curiosity to visit a florist and make inquiry regarding it, and was informed that the fronds are all from the New England States, being sent down by the millions in Autumn and kept in cold storage until wanted. Thus does bleak New England contribute to the enjoyment of a Southern winter.

WOODSIA OBSTUSA IN ALABAMA.—The impression that *Woodsia obtusa* does not occur south of Kentucky seems to be very common. In 1899 Mr. R. M. Harper recorded its occurrence in Georgia in this journal but subsequent lists, and even Prof. Underwood's "Our Native Ferns," continue to give Kentucky as the most southern locality for it. From its presence in Georgia, its occurrence in Alabama was to be inferred, and it is noted in Dr. Mohr's recently published volume on the Alabama flora, as growing in the northern and mountainous parts of the State. The range, however, may be extended some distance further South, as I have seen in the herbarium of Prof. R. S. Cocks, specimens of this collected near Selma, Ala. This seems to be the farthest southern station known for the plant at present.

NEPHROLEPIS EXALTATA AS AN OUTDOOR FERN.—In New Orleans, the common sword fern (*Nephrolepis exaltata*), is frequently planted out of doors and although the fronds do not survive the coldest winters, the rootstocks remain alive and send up new fronds very early in the year. It does not seem known that this species will withstand frost and it would be interesting to know how far north it will live out of doors. If protected by coarse litter in winter it might possibly be hardy as far north as the city of Washington.

SELAGINELLA ARENICOLA IN FLORIDA.—Until recently the Floridan *Selaginella* was referred to *Selaginella rupestris*, and little attention was paid to the localities for it; but since its separation as a distinct species more definite notes of its occurrence are desirable. Prof. Underwood records it from Eustis, Fla., and Chapman is quoted as finding it in Gadsden County, Florida. I have also received excellent specimens from Mr. Severin Rapp, of Sanford, Fla. This species is remarkable for the length of the fruiting spikes. They are probably the longest of any in the *rupestris* group, being often more than an inch long.

A NEW WAY TO OBTAIN SPORELINGS.

The gardener of a hotel in Florida noticed numerous little plants of Maiden-hair fern (*Adiantum capillus-veneris*) clinging to the side of a large pot containing an old plant. On examination he saw that the spores had fallen and germinated in the congenial warm, moist situation. He was fond of experimenting with ferns and prepared a large pan in which he put several bricks of the common building sort, and filled the pan about half full of water, coming about half way up the bricks. When they were thoroughly saturated he shook the spores of certain ferns upon them and awaited results. In this way he raised many ferns, though having sometimes to wait months for their full development. On inquiry I found that the most interesting feature of the plan to him was the variation he found in the young plants from their progenitors.—*Mrs. E. C. Anthony.*

SANDSTONE HABITS OF PELLAEA.

Referring to the localities for *Pellaea gracilis* in the April number, I would note that in Wisconsin this fern haunts two sandstone bluffs that I know of in the county of Juneau. Both face the north, but one juts out into the valley of the Lemon river, where a boulder is broken a few feet apart from the main bluff. This boulder was covered with *Pellaea gracilis* until a great flock of sheep were turned into the place to feed off everything. I found just three left in August, of 1896. The other spot is in one of the deep glens of the Big Creek, a branch of the Baraboo. Here they covered the face of the sandstone rocks above the shelving places. I think that as there is little limestone in Wisconsin the ferns substitute sandstone.—*Mrs. A. E. Goetting, Hyde Park, Cincinnati, Ohio.*

THE GENERA IN ASPIDIEAE

That section of the ferns which has afforded the most puzzles for the student and provoked the greatest discussions among the systematists is undoubtedly the Aspidieae. All too frequently the arrangement of the plants into genera has been made in an arbitrary manner. In a most excellent paper in the *Torrey Bulletin* for March, Prof. Underwood begins a survey of the matter by considering the characters upon which a proper classification is founded; for the question of generic names is closely bound up with that of generic characters. It is needless to say that the rules for applying fern names may be interpreted in various ways. Prof. Underwood's paper is a clear presentation of the facts in the case, so far as the origin and application of the various names is concerned. It has often been pointed out in the FERN BULLETIN, however, that we want names that we can anchor to, regardless as to whether they are correctly applied or not. We would be perfectly willing to adopt Prof. Underwood's names if certain no more changes would be made. The subjoined key taken from the paper in the *Torrey Bulletin*, will be of interest as showing Prof. Underwood's idea of the correct names. The genera in Italic are not represented in America but are included to round out the key.

KEY TO THE GENERA OF ASPIDIEAE.

Veins normally free, simple, forked, or pinnately branched.

Indusium normally absent.

Sori more or less elongate..... *LEPTOGRAMMA* J. Sm.

Sori round, punctiform.

Margins of segments plane, herbaceous....

..... *PHEGOPTERIS* Fee.

Margins of segments widely inflexed, membranous.

..... *PLECOSORUS* Fee.

Indusium orbicular, centrally peltate.

Pinnae continuous with the rachis; texture firm, more or less coriaceous. *POLYSTICHUM* Roth.

Pinnae articulated with the rachis, easily caducous, texture thin herbaceous. *CYCLOPELTIS* J. Sm.

Indusium oval, attached by a central axis to a thickened linear receptacle. *DIDYMOCHLAENA* Desv.

Indusium cordato-reniform, attached by the sinus.

Leaves simple, pedate; veins obscure. *CAMPTODIUM* Fee.

Leaves compound, pinnate; veins distinct

..... *DRYOPTERIS* Adans.

Veins pinnate, usually uniting into simple areolae especially toward the outer margin, atypically free. *PHANEROPHLEBIA* Presl.

Veins connivent, i. e., the branches from contiguous pinnate groups uniting to form one or more arches

Indusium normally absent.

Sori round, punctiform. *GONIOPTERIS* Presl.

Sori elongate on the more or less parallel transverse arches *MENISCUM* Schreb.

Indusium cordato-reniform, attached by the sinus..

..... *CYCLOSORUS* Link.

Indusium oblong, attached longitudinally by the center.

..... *Mesochlaena* R. Br.

Indusium orbicular, centrally peltate..... *Cyclodium* Presl.

Veins forming a single row of areolae next the midrib with free included veinlets, indusia elongate-cordate; leaves simple.

..... *FADYENIA* Hook. & Bauer.

Veins copiously anastomosing.

Indusium normally absent.

Leaves bipartite, the main vein dichotomous....

..... *Dipteris* Reinw.

Leaves pinnate *Dictyopteris* Presl.

Indusium orbicular, centrally peltate.

Areolae regular, with the included veinlets straight and directed towards the margins of the segments.

..... *Cyrtomium* Presl.

Areolae irregular, fine, the included veinlets often branched and recurrent *TECTARIA* Cav.

Indusium cordato-reniform, attached by the sinus.

..... *SAGENIA* Presl.

A NEW FORM OF THE BOULDER FERN.

BY WILLARD N. CLUTE.

While collecting plants last year at Andover, Conn., Mr. A. Vincent Osmun found a plant of *Dicksonia pilosiuscula* with all its fronds unlike those from normal plants. These fronds, about ten in number, were taken and later in the season, six more were secured. Some of these Mr. Osmun has recently sent me for identification, and as they appear to possess characters somewhat different from ordinary fronds, I think they deserve a separate name. The principal difference is found in the cutting of the frond, which is analogous to that exhibited by *Asplenium ebeneum* f. *serratum*, or *Botrychium obliquum* f. *dissectum*. In the present case the cutting between the teeth of the pinnules is very deep, each terminal veinlet being bordered by a narrow green wing of tissue for most of its length. I would describe it as follows:

DICKSONIA PILOSUSCULA, forma SCHIZOPHYLLA. Rootstock and stipe similar to the type. Fronds 6-22 inches in length; blade rather narrow, pinnae unequal in length, teeth of the ultimate pinnules very deeply cut, each vein forming the midrib of a narrow tongue-like segment. Collected at Andover, Conn., July 27, 1901, by A. Vincent Osmun. Type in my own herbarium.

The boulder fern is noted for the handsome cutting of its fronds, and this new form, carrying the cutting still further, makes a plant very desirable for cultivation. It is to be hoped

that the form will prove permanent and produce other plants. None of the fronds collected last year were fruitful.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

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METCALF, R. H. *Lygodium Palmatum in New Hampshire.* Fern Bulletin, Ap. 1902.

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Gamophyllous, Ap. 1902.

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Fern Bulletin, Ap. 1902.

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Ap. 1902.

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My. 1, 1902.

UNDERWOOD, L. M. *American Ferns.—III. Our Genera of*
Aspidicace. Torrey Bulletin, Mr. 1902.

UNDERWOOD, L. M. *Minor Inaccuracies.* Fern Bulletin, Ap.
1902.

WATERS, C. E. *An Analytical Key for the Ferns of the*
Northeastern States Based on the Stipes. Johns Hopkins Uni-
versity Circulars, Je. 1902.

_____. *New Forms of Boston Ferns,* illust. Gardening,
Ap. 1902.

LIST OF FERNWORTS COLLECTED IN JAMAICA

By WILLARD N. CLUTE.

(Continued.)

POLYSTICHUM Roth.

115. *P. Plasnickianum* (Kuntze). On moist banks at Morce's Gap. This species is similar in habit to our walking fern. (*Aspidium Plasnickianum* Kuntze.) (61).
116. *P. glandulosum* (Hook. & Grev). On dry rocks above Gordon Town. Rare. (*Aspidium glandulosum*. Hook. & Grev). (333).
117. *P. mucronatum* (Sw.) In dry woods at Cinchona. In habit like a *Nephrolepis*. Common. (*Aspidium mucronatum* Sw.) (68).
118. *P. triangulum* (Sw.) On dry shady rocks. Cedar Valley. Not common. The pinnules are much like holly leaves. (*Aspidium triangulum* Sw.) (170).
119. *P. tenue* Gilbert. Clyde river in moist shades. This was sent out as *Aspidium aculeatum* Sw. (136; 139).

ASPIDIUM Cav.

120. *A. trifoliatum* Sw. Common on moist banks at low altitudes. A well marked species. (232).

NEPHRODIUM Rich.

121. *N. sanctum* Baker. Moist banks at Port Antonio. Abundant. (252).
122. *N. caribaeum* Jenm. Cedar Valley. (No number).
123. *N. rigidulum* Baker. Moody's Gap. Common in shade. (173).
124. *N. oligocarpum* Hook. Abundant at Cinchona in woods (101).
125. *N. Sprengelii* Hook. On banks above Moore Town. Plentiful. (257a).
126. *N. Jenmani* Baker. Latimer river in shade. (142).
127. *N. stipulare* Moore. Along roadsides at Cinchona. (364).
128. *N. denticulatum* Hook. Abundant in forests at Morce's Gap. A handsome species with some resemblance to *N. Spinulosum*. (178).
129. *N. effusum* Baker. Clyde river. Common. Fronds nearly triangular. (134).
130. *N. amplum* Baker. Clyde river. Common. (132).
131. *N. villosum* Presl. Moody's Gap. Rare. A very large deltoid frond with the inferior pinnules on the basal pinnae greatly enlarged and often reaching the size of the middle pinnae. Indusia large and conspicuous; fronds hairy. (161).
132. *N. Gilberti* Clute. Not uncommon at Cuna Cuna Gap in shade. (*Dryopteris Gilberti* Clute). (200a).
133. *N. hastaeifolium* (Sw.) On wet rocks above Mooretown. Common. (*Polyodium hastaeifolium* Sw.) (262).

This and the two following species are usually classed as *Polypodiums*. All parts of their structure, however, indicate a closer alliance with the *Nephrodiums*, and they are placed here for that reason.

134. *N. decussatum* (L.) Moody's Gap. A remarkably handsome species with fronds six feet or more tall, simply pinnate. (*Polyodium decussatum* L.) (163).

135. *N. caudatum* (Kaulf.) Above Gordon town. (*Polypodium caudatum* Kaulf.). (375).
136. *N. scolopendrioides* Hook. Port Antonio. Abundant on moist banks. The variety *littorale* was collected with the type. (175).
137. *N. deltoideum* Desv. Not uncommon in the eastern part of the island. A peculiar form with the lower half of the frond suddenly much diminished. (264).
138. *N. Serra* Desv. On half-shady banks above Moore Town. (255).
139. *N. Sloanei* Baker. Clyde river, in moist woods. A conspicuous and handsome species. (131).
140. *N. patens* Desv. In half-open places about Cinchona. Common. (100).
141. *N. mollc* Desv. On moist banks at Port Antonio. (244).
142. *N. guadalupense* Baker. With the preceding; tolerably common. (335).
143. *N. unitum* R. Br. In salt pond, near Guava Ridge, growing with *Osmunda cinnamomea*. Has much the aspect of *thelypteris*. (241).
144. *N. asplenoides reptans* Sw. Abundant on moist banks at Port Antonio. Fertile fronds erect; sterile, prostrate and rooting. (333).
145. *N. venustum* Sm. On shady banks, Port Antonio. (282b).
146. *N. serrulatum paucipinnatum* Jenm. In shade, Morce's Gap. Plentiful. (120).
147. *N. obliteratum* (Sw.) Port Antonio. Common. This and the two following species usually regarded as *Poly podiums*, are included here for the same reason as Nos. 133, 134 and 135. (*Polypodium obliteratum*). (246).
148. *N. crenatum* Sw. Port Antonio. Common. (*Polypodium crenatum* Sw.) (245).
149. *N. tetragonum* (L.) Abundant at low altitudes. (*Poly podium tetragonum* L.) (44).

EDITORIAL.

Once more the editor is at home, and the work of catching up with a greatly neglected correspondence has begun. Correspondents who do not soon receive replies to their queries are requested to write again.

* *

By an unfortunate error the table of contents to Volume IX. was printed on the back of the title page, and the mistake was not noticed until after the edition had been mailed. With this issue a new and correct title page is mailed to all subscribers. We hope this notice is not too late to prevent the wrong pages being bound with the volume.

* *

Last month a complete file of the FERN BULLETIN was sold for eight dollars, it being the first set offered for sale in two years so far as we are aware. Although each issue of the first numbers contained from 300 to 500 copies, these numbers are very difficult to obtain, and if any of our subscribers happen to have duplicates of any of these numbers, or if they care to sell their own set, we can quickly put them in communication with purchasers. Address this office.

* *

Although a considerable number have signified their desire for a set of the FERN BULLETIN, if reprinted, it has been decided not to reprint. The supply of Volume VI. is nearly exhausted and we believe that the money necessary for reprinting all these numbers might better be spent in improving future issues. Since its beginning the journal has never been indexed. An index to all the volumes, including the present one, is being prepared and will probably be issued late in the year.

* *

The editor is preparing a companion volume to "Our Ferns in Their Haunts," which will be entitled "The Fern Allies of

North America." He will be much pleased to receive notes on any of the rarer fern allies and will give good exchange for specimens of them.

NOTES.

The American Botanical Club is the name of a new society for the study of plants by correspondence. The dues are but 25 cents a year, and all who are interested in plants are invited to become members. Application for membership should be made to J. C. Buchheister, Griffins Corners, Delaware County, N. Y.

The Ninth Annual Report of the Chapter contains, in addition to the usual reports, obituary notices of two members who died in 1901. The list of members contains 128 names, and there is an unusually large balance in the hands of the treasurer. The Chapter seems to be in a very flourishing condition.

Mr. Waters' "Analytical Key for the Ferns of the North-eastern States based on the Stipes" is an amplification of an earlier key issued in 1895. While it is not expected that such a key will ever become popular in identifying ferns, it is, nevertheless of much interest to students of fern structure. It shows a large amount of careful work, and the author is to be felicitated upon its completion.

BOOK NEWS.

Prof. Frederick DeForest Heald has written a "Laboratory Manual in Elementary Biology"† that is intended primarily for use in High schools and colleges, but which may well be taken as a manual by any one studying alone. The book is about equally divided between the biology of the plant and the biology of the animal, and each part begins with the simple forms and ends with the complex. The book is a departure from the old méthode of

†*Laboratory Manual in Elementary Biology*, by Frederick DeForest Heald, Binghamton, N. Y. Willard N. Clute & Co., 1902. pp. 288. Price \$1.25.

telling the student what to see and expecting him to see it. Instead, after directing the student how to manipulate his material, there is a series of questions in each paragraph which requires his original investigation to answer. The author has gone into the work most thoroughly, and the book should have a wide vogue among teachers and students.

The guides to our wildflowers continue to multiply, and one of the best of recent works is F. Schuyler Matthews' "Field-book of American Wild-flowers."† This book has one merit that none of the others possess, namely, its size, which adapts it for carrying in the pocket. There are twenty-four plates in color and 200 full page illustrations in black and white by the author, in addition to descriptions of nearly five hundred characteristic wild-flowers of the northeastern States. These descriptions are in plain English, so far as the limitations of the subject permit, and one will find interspersed with the descriptive matter many observations of interest. Special attention has been paid to the insects which pollenate the different species. Being artist as well as author, Mr. Matthews has attempted to name more correctly the colors of our flowers, and his book will certainly be a reference book on this subject. The rest of the text is accurate and conservative and will delight the rambler who goes afiel with a book in his pocket.

Dr. D. T. MacDougal's "Experimental Plant Physiology," issued in 1895, having gone out of print, the author has replaced it with a volume entitled "Elementary Plant Physiology"‡ which follows very much the lines of the earlier volume. Directions are given for performing various experiments to show the phenomena of growth, nutrition, respiration, etc., etc. There are 108 illustrations. The experiments requiring to be made are such as can be made with the cheapest and simplest apparatus.

†The Field-book of American Wild-flowers, by F. Schuyler Matthews, New York; G. P. Putnam's Sons, 1902. pp. 550. Price, \$1.75 net.

‡Elementary Plant Physiology, by Daniel Trembley MacDougal; Longmans, Green & Co., New York, 1902. pp. 137.

In the new "According to Season"*, Mrs. Parsons has given us a book uniform with her "How to Know the Wild Flowers" and "How to Know the Ferns," and worthy to rank with them in popularity. The first issue was a good book, but the new one is much better and makes very good reading for vacation days at any time of the year. The book follows the seasons and marginal titles to the paragraphs render reference easy. Several chapters have been added. There are thirty-two plates in color by Elsie Louise Shaw.

That ever delightful subject for investigation—the cross pollination of flowers by insects—has been treated in a most interesting way by Eleanor E. Davie, in "Blossom Hosts and Insect Guests."[†] The late William Hamilton Gibson is supposed to be the first American to give much attention to this subject, but his contributions appeared in various places and are not as well known as they deserve to be. All these articles have now been brought together by the editor-author, who has added sufficient new matter to make a complete volume. The charming drawings, with which Gibson illustrated his articles, have also been included, and the book is probably the best handbook we have for studying the cross pollination of flowers. It contains as a supplement a list of nearly 250 wild-flowers with notes on their methods of pollination and the names of the insects that assist in the work.

C. G. Lloyd, the well-known mycologist of Cincinnati has just issued an excellent pamphlet on the Geasters (earth-stars) of North America, illustrated with eighty figures from photographs. This pamphlet is one of a series that is being issued, and is sent free to those who make the author suitable return in the shape of puff-balls, earth-stars and allied fungi.

The editor of the FERN BULLETIN has been prevailed upon to issue the illustrated Key to the Genera in his "Our Ferns in their Haunts" in convenient size for carrying into the field. With this

*According to Season, by Frances Theodora Parsons, New York; Charles Scribner's Sons, 1902. pp. 197. \$1.75 net.

[†]Blossom Hosts and Insect Guests, by William Hamilton Gibson, edited by Eleanor E. Davie, New York; Newson & Co., pp. 198. Price, 80 cents.

key has also been published new chapters on how to distinguish ferns from other plants, where to find ferns and how to identify them, with lists of the species inhabiting various locations. Instructions are given for collecting, pressing and mounting ferns, and for arranging for mailing. Much information is given which should help the beginner in identifying ferns. There are numerous illustrations, an extensive glossary and a list of the species and principle varieties in the Northeastern States. The book is entitled "A Fern Collector's Guide."*

THE LINNEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—Miss Ella Ada Noyes, long a member of the Chapter, died at her home in Newburyport, Mass., June 22, 1902. A more extended notice will be published in the annual report.—C.

—A reprint of Mr. Waters' key to the ferns based upon their stipes has been made and copies sent to all members of the Chapter.—C.

NOTE FROM THE TREASURER

Very likely it is because the blue pencil mark is so commonly used by publishers as a notice to "pay up" that so many members mistook the marked passage in last Treasurer's report as having reference to arrearages for dues. Such, however, was not his meaning. He is happy to state that arrearages for dues of 1902 are less than ever before in the history of the chapter, and for the most part dues have been paid promptly. The meaning of the marked paragraph was that the members should pay their dues to the treasurer direct, thus saving him much trouble and annoyance, with seemingly no more inconvenience to the members. Many members appear to think that the *BULLETIN* is still published by the Chapter, and think if dues are sent to Mr. Clute, the editor, it is the same as if paid to the treasurer of the Chapter, but this is an erroneous idea.—J. A. G.

*A Fern Collector's Guide, by Willard N. Clute, New York; The F. A. Stokes Co., 1902. Price 50c.

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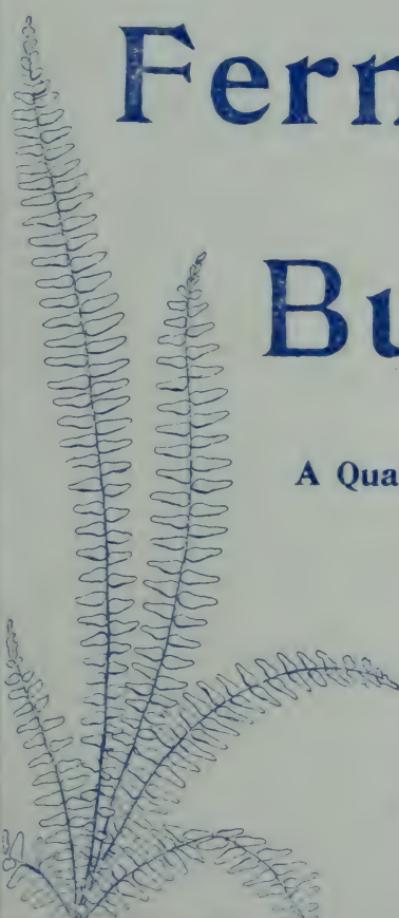
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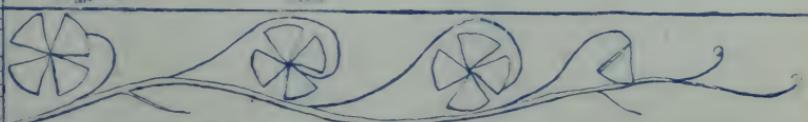
The Fern Bulletin.

A Quarterly Devoted to Ferns.

OCTOBER



Binghamton, N. Y.
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1902



THE FERN BULLETIN

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WILLARD N. CLUTE, Editor

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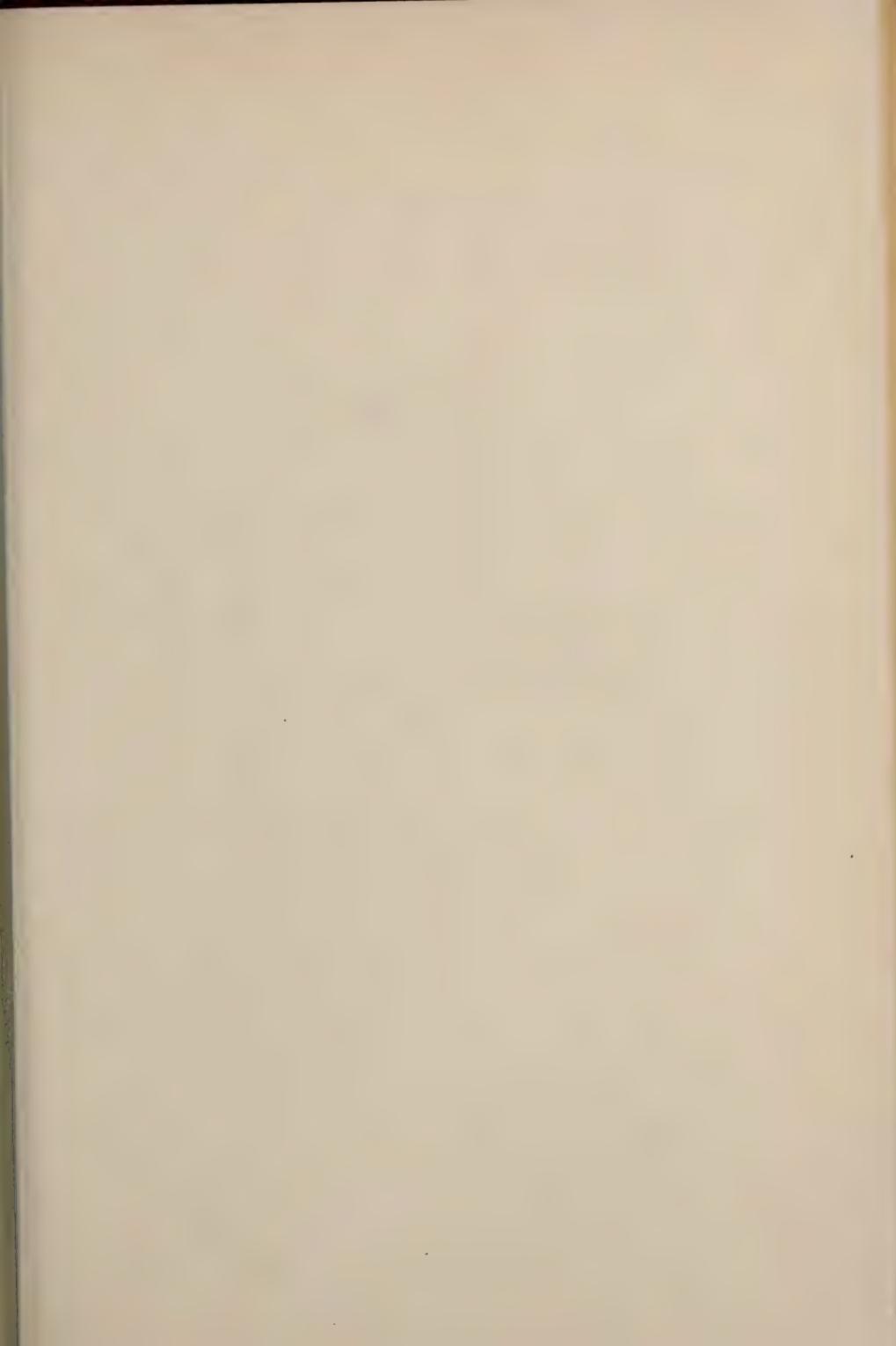
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WILLARD NELSON CLUTE

THE FERN BULLETIN

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OCTOBER, 1902

No. 4

EARLY FERN STUDY IN AMERICA.

BY GEORGE E. DAVENPORT.

My interest in the ferns was first awakened while collecting wild flowers for the Massachusetts Horticultural Society's exhibitions of native plants in 1873. When in the woods one day with the late veteran botanist, Mr. E. H. Hitchings, whose fine exhibits of native plants had for some years done so much toward making the beauty of our New England flora known, we became interested in some ferns that attracted our attention on account of their peculiar grace and loveliness, and the desire to know something more about them than we did at that time led us both to begin a systematic study of fern plants. Mr. Hitchings subsequently collected and arranged a large herbarium of native ferns that was especially rich in abnormal forms of the *Botrychium ternatum* group for the detection of which that keen-eyed observer seemed to have a special gift. After his death his valuable collection was presented, in accordance with his request, to the Appalachian Mountain Club by his children, and it now reposes in that club's general herbarium, where it is available for reference through the custodian.

The nucleus for my own collection was presented to the Massachusetts Horticultural Society in 1875, and with its subsequent additions, has long been a part of the library where it is always available to fern students for reference on application to the librarian. Besides these collections of Mr. Hitchings and myself, my good friend John Robinson, of Salem, who at that time was one of the group of native plant exhibitors, of which also Mr. Charles W. Jenks, and Mrs. C. N. S. Horner were active members, made some beautiful collections which he afterwards arranged systematically for the herbarium of the Essex Institute, and where they are available for consultation by fern students.

The exhibitions of the Massachusetts Horticultural Society which have been referred to, have long been one of the most important agencies for the dissemination of a knowledge of our native plants, and in recent years the splendid exhibits of Mrs. P. D. Richards, the Misses Moran, Noyes, Grinnell, and others have been instrumental in making scores of visitors familiar with the appearance of the ferns.

Previous to the publication of John Williamson's "Ferns of Kentucky," in 1878, no distinctively American Hand Book on the ferns existed, and when we compare the condition of American fern literature at that time with that of the present, we see at once how meagre and almost inaccessible it was for general use, but we also see that it was then the very beginning of a period which was destined to develop a remarkable interest in fern life and lead to the production of popular and scientific fern books that have become the nucleus for a splendid American fern literature. The delightful chapters on ferns in Mrs. Dana's and Mrs. Wright's charming books, and the beautiful book of Mr. Clute's, which is devoted wholly to ferns, have placed within the reach of fern students of the present time matter which we of the earlier days were obliged to look for in Hooker, Moore, Lowe, Cooke, Anne Pratt, Johnson and other English fern books, while the splendid work of Farlow, Campbell, Atkinson and Bessey has given to us the more technical and scientific knowledge which characterizes the superb works of Hoffmeister, Sachs, DeBary, Goebel, Luerssen and others.

At the time, however, of beginning my own study, and until well on into the seventies, the only practical American fern literature coming within our limits, available for a beginner's use was in Bigelow's "Flora Bostoniensis," Gray's and Wood's Botanies and Chapman's "Flora." Beside these I had an old copy of Mrs. Lincoln's "Botanical Lectures," which I found occasionally very helpful. But such other matter as may have existed in the form of short notes and newspaper or magazine articles were scattered through many publications in such a manner as to be practically inaccessible, and therefore of no use to a novice. If, however, all such matter could possibly be collected and properly arranged it would become an exceedingly useful and

valuable part of a fern literature well worthy of preservation. But all this was soon to be changed. The lamented Williamson, whose interpretations of fern life, especially in his exquisite "Fern Etchings," came like an inspiration, was the pioneer of this movement, although simultaneously the larger and more comprehensive work of Prof. Daniel Cady Eaton, was being issued to subscribers in parts, and the first volume was published in 1879. Previous to the publication of his fern books John Williamson published a "List of Thirty-one Kentucky Ferns," in the Catalogue of the Louisville Industrial Exposition for 1875, and in the *Bulletin of the Torrey Botanical Club* for October, 1879, gave an account of his finding *Scolopendrium* in Tennessee. The period covered by the seventies is memorable on account of the impetus given to fern literature in this country. Besides his larger work on the "Ferns of North America," Prof. Eaton published in *Torrey Bulletin* a series of valuable notes on "New and Little Known Ferns of the United States," extending from March, 1873, well into the eighties, also "Ferns of the Southwest," in Lieut. Wheeler's Report for 1877, and prepared for publication in Vol. II of the "Botany of California," which was published in 1880, his elaboration of the ferns of California. He also published in *Canadian Naturalist* for March, 1870, some critical observations on some American ferns in the Herbaria of Linne and Michaux, that were collected or named by those early botanists. In 1878 Prof. John Robinson's admirable Hand Book on "Ferns in Their Homes and Ours" appeared and has proved to be an invaluable guide to the collection and cultivation of native ferns.

My own contributions to this period of our fern history have been monographs on "*Botrychium simplex*" in 1877, "*Vernation in Botrychia*" in *Torrey Bulletin*, January, 1878, and "*Aspidium spinulosum and its Varieties*" in *American Naturalist*, November, 1878. Also a descriptive account of the "Ferns of Massachusetts," in a series of articles on the "Flora of Medford," in *Medford Chronicle*, 1875-6, and in 1879, a "Descriptive Catalogue" of the ferns then in the "Davenport Herbarium" of the Massa-1875 a "Catalogue of North American Ferns" in the Herbarium chusetts Horticultural Society. During this period I published in

of the Massachusetts Horticultural Society, which was more in the nature of a check-list, and in the same year began my series of "Fern Notes" in the *Torrey Bulletin*. During this period also some useful check-lists were published by John Robinson and Wm. Edwards, and in 1875 John H. Redfield published in *Torrey Bulletin* his valuable paper on the "Geographical Distribution of the Ferns of North America."

In the latter part of the seventies the matter for "Our Native Ferns and Their Allies," by Dr. Underwood must have been well in hand although it was not published until 1881. Nevertheless its conception and preparation must belong to the seventies and the fact of its having reached a sixth edition is evidence of its having proved to be a useful and valuable work.

During the seventies and eighties I had many interesting and varied experiences which I love to recall, especially the excursions through Essex County with John Robinson, the Chestnut Hill district and Purgatory Swamp with Mr. Hitchings, and the Faxon's, Edwin and Charles, and the trip to Smugglers' Notch with dear Mr. Pringle.

During the twenty-nine years of my fern work I have had the pleasure of witnessing the gradually increasing fern-love crystallize into the formation of the LINNAEAN FERN CHAPTER, and the FERN BULLETIN, and the satisfaction of having some who at first would want to know "what good those weeds were anyway" come to be enthusiastic lovers of them. For such is often the case. As one comes under the influence of the nature-love he begins to realize that there is more in these "weeds" than he ever dreamed of before, and finds that the ferns, with their delightful exhalations from the very sanctuary of Nature are often-times "ministering angels," indeed.

One of my early correspondents, whose life was shadowed by a great sorrow, once wrote to me that he came to find great consolation in his newly awakened love for the ferns. Ah, yes, the fern love will indeed soothe the spirit, and enable one to bear up under severe afflictions, and sweeten memories that become more and more precious with the lapse of time. Can I ever forget the dear sweet voice which is ever sounding in my ears, "here is one fern, papa?"

The ferns are the highest personifications of grace and beauty. They represent the finest type of refinement and appeal irresistably to everything that is best within us. I am glad that the "Fern Chapter" is doing so much to increase the love for these beautiful creations of the Good Father, and trust that every member will become a misisonary for its propagation.

Medford, Mass.

A TEN YEAR'S RETROSPECT.

By WILLARD N. CLUTE.

Ten years is not a remarkably long period of time, measured by ordinary standards, but the completion of ten years of uninterrupted publication by a botanical journal is an event of sufficient rarity to make it noteworthy. There is a great mortality among infant botanical publications. In nearly every case they are afflicted with a malady called poor circulation, and very careful nursing is required to bring them through their early years. Thus it happens that the FERN BULLETIN at the end of its tenth volume, is the third oldest of the strictly botanical journals published in America, horticultural journals, of course, being excluded. To signalize the event, a survey of fern study during that time is here presented.

In the beginning the FERN BULLETIN was not intended for general circulation. Established as a means of communication between the widely scattered members of the Fern Chapter, its pages were made small enough to allow copies to be enclosed with letters and no thought was entertained of its developing into anything larger. Soon, however, applications for the numbers began to come in from people outside the Fern Chapter and then it was that it took on the airs of a magazine of some importance and was regularly issued. The facetiously inclined, taking an analogy from the life of a fern, are wont to refer to those early numbers as the prothallium stage of the magazine. The analogy, seems a good one, however, for like the fern plant, it has continued to develop by the addition of more and larger leaves until it covers the whole field and now publishes yearly more matter pertaining to

ferns than all other American publications put together. At the recent Paris Exposition, it was one of the publications to be awarded the Grand Prize.

To find subscribers enough to make such a publication self-supporting has not been the easiest of tasks as may be inferred by any one who reflects how few students of ferns there are in his own vicinity. We have had to sift a great share of the habitable globe for our purpose and the magazine now goes to every State in the Union except two, and also to Canada, Mexico, England, Scotland, Germany, Austria, Switzerland, India, Japan, New Zealand, the Philippines, Cuba, Porto Rico and Jamaica.

At the beginning of the FERN BULLETIN's career, the few botanists who were studying ferns were doing so independently and often without a knowledge of the existence of others engaged in the same pursuit. The Fern Chapter, with the aid of the magazine, has been instrumental in uniting these students into one strong association, which is not only the largest society of fern students in existence, but one of the largest of American botanical societies. Comparatively few members are personally acquainted but so fascinating is the study that new members are constantly received.

With the increase in the number of readers who were not members of the Fern Chapter, the scope of the magazine began to broaden. The aim of the editor has always been to make our ferns familiar to the largest number, and much attention has been given to such subjects as the haunts, habits, uses and folk-lore of ferns as well as to directions for identifying or recognizing our native species. In this way a well informed and constantly enlarging audience has been provided for the more technical publications of fern students. At the same time the necessity for a more exact knowledge of the ferns was not lost sight of. The study of the habitats and distribution of ferns and the comparative study of different species, has steadily been advocated, resulting in the extension of the known range of many ferns, the finding of numerous new species, varieties and forms, and the addition of a great number of new facts to our knowledge of the ferns. This is particularly true of the fern allies, which ten years ago were practically unknown to any save a few expert botanists, but which now are familiar to most students of the ferns. THE

FERN BULLETIN has also been largely instrumental in introducing into America, the practice of giving form names to such plants as do not attain to the rank of species or sub-species. Formerly it was the custom to consider each lesser variation of a plant as a sub-species or variety, resulting in the mixing of seasonal, accidental and geographical forms in a very heterogeneous category. The magazine has catered to no school, and whenever possible has printed both sides of every question, leaving its readers free to judge for themselves.

It has also fallen to the BULLETIN'S lot to be a pioneer in making the study of mosses popular. The *Bryologist*, now a successful separate publication, is an own child of the BULLETIN'S, and for two years was published with it. It was while the two publications were thus combined that the Sullivant Moss Chapter, an organization similar to the Fern Chapter, was formed.

Many other events have occurred in the past decade to make it remarkable in the annals of fern study. At its beginning, *Asplenium ebenoides* was firmly entrenched as a species, but with occasional suggestions regarding its hybridity; now it is a proven hybrid. *Onoclea sensibilis f. obtusilobata* was by some considered a species, by others a good variety; now it is known to be a mere form that can be produced at will. The observations that have contributed to a correct conception of these forms have thrown much light upon aberrant forms in general and placed our ideas of the limitation of species upon a much more stable foundation. Ten years ago, the lists of ferns were scarcely more than mere lists of names. Since then there have been published three complete lists of the ferns and fern allies with distribution and often common names and synonymy given.

At the beginning of the decade there were no American fern books of a popular nature; now we have Mrs. Parsons' excellent "How to Know the Ferns," and my own "Fern Collector's Guide," and "Our Ferns in Their Haunts." Mr. Dodge's valuable, though more technical little manual on "The Ferns and Fern Allies of New England" belongs to this period, as does also Miss Price's "Fern Collector's Handbook." There have also been numerous lesser publications on ferns issued, among which should be mentioned Shimek's "Ferns of Nicaragua," Underwood's "Review of

the Genera of Ferns," Atkinson's "Transformation of Sporophyllary to Vegetative Organs," and Mrs. Britton's "Life History of *Schizaea Pusilla*." It is interesting to note in this connection that the books of the decade preceding the one just passed are all out of print. Williamson's "Ferns of Kentucky," was first to go. "Eaton's "Ferns of North America," and Robinson's "Ferns in Their Homes and Ours" have gone out of print during the present year.

Thus our survey reaches the present. What the future will bring is a matter for pleasant speculation. The decade now closing has been by far the most productive in the history of American fern study, but it is very likely that the one beginning will surpass it. If one can judge of the future by the events of the past, it may be prophesied that the next ten years will be characterized by still greater activity in the study of varieties and forms. The number of new species yet to be found in North America is extremely small, but we are just entering upon an era of intensive study that will more clearly limit species and define the lesser forms. The cultivation of ferns in the conservatory and the fern garden is also likely to receive added impetus throwing new light upon the development of many species, particularly those like *Botrychium dissectum* whose specific rank is still questioned. The rearing of ferns from spores and the study of the young forms is no doubt destined to be taken up by many. In ten years more the range of most of our species will be defined with greater exactness and their life histories fairly well known. That it may continue to chronicle these events as they pass, is the ambition of the FERN BULLETIN.

There seems to be a much greater diversity in the habitat of *Ophioglossum vulgatum* than the books are accustomed to credit it with. From the Catskill Mountains Mr. T. C. Buchheister reports specimens both in sphagnum swamps and on dry hillsides, the latter in company with blue-berries and *Lycopodiums*. The swamp specimens were 15 inches or more high, while those in dry ground were less than half that height. There was the usual abundance of sterile plants and some fertile specimens with sessile fruiting spikes were noted.

SOME FEATURES OF FUTURE FERN STUDY.

BY LUCIEN M. UNDERWOOD.

While at the great Kew collection of ferns in 1898 studying the species represented in America and following the sequence of "Synopsis Filicum," in accordance with which that collection is arranged, I made the following note in the genus *Polypodium*: "186. *P. vulgare*. The following species at least are involved: (1). *P. vulgare*. N. Europe; (2). *P. serratum*; (3) *P. —* Madeira; (4). *P. —* Japan, frond coiling; (5). *P. —* Rydberg's small form." The South European *P. serratum* (2) by many continental botanists is now held to be distinct, as is also the luxuriant species (3) from Madeira. Since 1898, Mr. Maxon working independently has come to the same conclusions as myself regarding the forms (4) and (5) and has described them both as new species.

The above incident illustrates the first advance that will be made in the future study of our American ferns, viz.: the delimitation of closely allied species that have hitherto been tied up in specific groups under single names. Something has been done in this direction among our species of *Botrychium*, of *Sclaginella*, of *Lycopodium*, and of *Polypodium*, in all of which groups more work still remains to be done. But there are other groups in which delimitation is necessary to distinguish species and varieties more carefully. Among these we may mention *Asplenium filix-femina* on which Mr. Gilbert has made a preliminary study; *Dryopteris spinulosa* on which Mr. Davenport made his maiden study over a quarter of a century ago; *Wood-sia obtusa*, *Filix fragilis*, *Polystichum munitum*, and perhaps others. It is not the random description of some sport or freak as a "var. *cristata*" or "var. *furcata*" that we want. Such so-called varieties are of no value from a taxonomic standpoint; they are as unnecessary as they are irrational. Neither have such varieties as "var. *incisum*" of *Polystichum acrostichoides* and "var. *Hortonae*" of *Asplenium platyneuron*, freaks likely to occur on the same plant as normal leaves, any more substantial standing. Much less do we want the refinements of such puerilities as *forma* this and *forma* that, which have no semblance of

scientific worth. What we do want is the careful delimitation of distinct species or sub-species, not mere accidental variations. This will not come with haste, and more than that, with inexperience; some of it will come from familiarity with plants in the field in two continents in which allied species grow; some of it will come from the study of extensive suites in the larger herbaria; some will come from the actual cultivation of plants under different forms of environment; some will come from widely extended study afield in our own country for continued seasons and in many places where different environment may modify specific lines; some will doubtless come from a study of the younger stages of our native species.

And this leads me to a line of work that will likely form a very conspicuous feature in the fern study of the next few years. Comparatively few fern students are familiar with our native species in their young stages, not only those that are in the first or second leaf from the prothallus, but even when the plants are half grown.* It is probable too, that new and possibly unexpected relationships will be brought out by such study. Surely the work by Miss Slosson on the bybrid form just published opens up an interesting field of work, as does the more elaborate paper of Mrs. Britton and Miss Taylor on *Vittaria*.

Anatomical studies such as that commenced by Mr. Waters may well be extended so as to cover a wider range of species, and new distinguishing characters between many species will doubtless be found which now are difficult to distinguish.

The range of American ferns, using America in its limited sense including simply North America north of Mexico, represents too limited a fern flora to give a clear range of perspective in regard to the broader questions of generic relations. Such conceptions must come from a study of a fern flora more diversified than our own, such as that of the American tropics, of Hawaii, of Japan, or of the far East. During the next decade it will become as easy to secure material for study from

*Within the past few days a specimen of young *Adiantum pedatum* has been set me which was said "to resemble *A. Capillus-veneris*" from its pinnate leaf. The reported discovery of *A. capillus-veneris* from Southern New York a few years ago was based on a want of knowledge of the young stages of this, our commonest species of fern, so different from the familiar outline of the mature maidenhair,

these regions as it is now to obtain our remote Arizonian and Californian species. The effects of the Spanish War of 1898 on our relations to tropical vegetation have been wide reaching, and it remains for American Anglo-Saxon students to study exhaustively the ferns of all America, the Hawaiian Islands, and the Philippines whose treasures are as yet scarcely entered upon by Europeans even.

But these thoughts take us far beyond the original intent of my subject yet they only emphasize the fact that the world is a unit and even in fern study we will do well to bear in mind not to become too narrow in our conceptions. We can no longer look to Europeans as authorities on ferns. We must make comparative studies of the European species and our own. We cannot get a grasp of what our Floridian and Arizonian species really are without studying the same species from their normal range farther south where they are not affected by conditions arising from being "at their northern limit." In some genera a proper conception of the relations must be brought out by a knowledge of species from even more remote localities. It is only in a narrow accommodated sense that "he is the best naturalist who knows his own parish well" for in knowing only that, one is liable to draw wrong conclusions and gain an improper perspective of the true relations of things.

Columbia University, New York.

BRITISH FERN CULTURE.

BY CHARLES T. DRUERY, F. L. S.

Responding with much pleasure to Mr. Clute's expressed desire for a short article in the above connection, I start out by remarking that the term "fern culture" in connection with the numerous departures from the specific forms which have originated in these islands is largely misleading, ranking in this respect with that of "garden varieties," which is far too frequently used by the botanist. Culture has had absolutely nothing to do with the origination of the great bulk of the forms of our native

ferns in cultivation, since they were found wild under perfectly natural conditions. Mr. E. J. Lowe's list of varieties, embracing over 1,800 described forms, when analyzed is found to embrace no less than 1,100 wild finds, i. e., two-thirds, the remaining third consisting of forms which have been subsequently raised from these and varied again on more marked lines. Hence, obviously, it is only this last section that can with any propriety be ranked as cultural or garden productions, while to so term perfectly spontaneous or naturally wild sports is at once misleading and unscientific.

In these islands the particular hobby of fern hunting has been ridden so long and by so many enthusiasts that the cult has long ceased to embrace species hunting except by neophytes, and in this respect we find a primary difference between the fern study of the States and here. The vast area of the United States and the relatively recent pursuit of fern research on your side admits of the possibilities of new species being found, or at any rate extended habitats of known ones and this, of course, renders species hunting of great interest to those who aim at completing the local flora of their particular localities. Here the work is practically finished and hence the really studious fernist takes the next logical step in fern research by seeking for aberrant types which by their distinct form and reproduction certainly meet the botanical definition of new species.

In this connection I would point out that for a long time these abnormal types were regarded by the scientific botanist as forming exceptions which only merited to be ignored. As above mentioned they were generally called "garden forms," and as such were relegated to the unscientific limbo of the myriad cultivated forms of flowers raised by horticulturists by selection from seedlings of plants which have long been subjected to artificial treatment, high feeding, close culture and so on, to say nothing of disturbed reproductive powers due to crossing. Of late years, however, (thanks, I venture to think, to some extent to my own persistent advocacy of the theory that natural "sports" by these exceptional characters might well betray nature's secrets more freely than stereotyped normals) the wild varieties have received more attention and as a result it has been found that *every single*

presumed hard and fast line in the life of a fern has been broken through; every link in the chain has been found capable of elimination. Spore, prothallus, archegonia, antheridia and antherozoids and even the frond itself has been "jumped," as it were, the last elision constituting the climax since the production of spores on the prothallus itself (discovered by Mr. Lang in cultures from spores of two species from my collection) carries the fern back to the tiny marchantioid phase which possibly represents the alpha of fern evolution. From these facts we perceive that variety hunting is not only a legitimate sequence of species hunting but is also fraught with scientific interest. Personally, I have no doubt whatever that the cult in the United States will follow the same course, but it will have the advantage if it will only profit by it, as I hope it will, of the recorded knowledge obtained on this side, and the greater readiness of the biologist to recognize the possibility of new lessons being derived from new discoveries.

So much for the status of the wild fern and its scientific value. Having given these first place I would emphasize the greater beauty and charm which many of these forms possess over the normal, and in addition their capacity in most cases of even greater improvement by subsequent selection and crossing. No one who has not visited a choice collection of these abnormal forms could conceive to what extent they are capable of development and into what a range of size they can vary, from giant through the normal to the dwarf. I have in sight as I write a range of plumose Athyria, with quinquepinnate fronds over four feet high in a dozen quite distinct forms, some tasselled to the fourth degree, and as a contrast a row of thumb pots freely accommodating a set of dwarf gems of the same species of hardly as many inches; one is like a mass of superfine *Selaginella apoda*, another bristles with excurrent mid-ribs, like tiny thorns, another is a perfect rosette of dense congested fronds, three inches long and so on. These represent the cultural results, but the wild parents of every one was far advanced on like lines when found, and I do not know of a single marked and original type which was not first, so to speak, invented by unaided nature. All that man can do is to find such inventions (special creations, I call them) and work them up.

These improved types, or garden forms proper, possess, however, despite their greater beauty, a secondary interest in the fern hunter's mind. It is a great pleasure to him, undoubtedly, to discover an extra good thing among his seedlings (an admissible term as the plants arise from a fertilized ovum embedded in the prothallus), but his glee is ten-fold greater when he finds a new thing on the hillside, in the glen, on the moor, or even by the roadside. Thousands of ferns of the common type have passed beneath his eye all practically alike as peas, and then suddenly it may be but a frond tip, it may be a bush, strikes him in the distance as unfamiliar. He approaches and with a heart ever beating faster, he acquires the conviction that it fits with nothing known to him and finally he stands before a thoroughbred marked throughout with novel features. That is a moment never to be forgotten, and the writer speaks feelingly, for thanks to good luck he has many such episodes in his own memory. No royal road exists to such finds. They appear to turn up absolutely indiscriminately and irrespective of environment. As a rule they are solitary plants of their kind, though they may be one in a crowd of their species. Rarely a small colony may be found, due presumably to scattered spores of an original sport. Generally, also, they come true from their spores, and it is this fact which technically qualifies them as species, *per se*, for granting such constancy no specific definition can exclude them. Personally, however, we blame the defective definition, for to admit them as species, in the case of over 1,100 finds, would be an absurdity. On the other hand, some of the more prominent botanists of the present day, in Germany especially, are contending, and we think with much force, that these "sports" have probably played a more important role in the specific evolution of all branches of the biological tree than has hitherto been conceded them.

Finally, I would beg our fern-loving American cousins to profit by the fern lore of this side of the ocean and thus avoid the risk to which I have previously alluded in the BULLETIN of compiling separate and perhaps conflicting lists of names. Nomenclature already is a bug-bear, largely due to the independence of name-givers. Let us, as fern lovers, do what we can to avoid a spread of the evil, at any rate so far as the species

native to the two areas are concerned. The numerous varieties found here have been classified to some extent into sections which is a great aid and guide in naming new ones, but much remains to be done yet in systematizing nomenclature. The plumose types of varieties, for instance, characterized by great foliar development correlated with entire or partial barrenness exemplified in *Polypodium vulgare f. cambricum*, in *Scolopendrium vulgare f. crispum*, *Nephrolepis rufescens f. tripinnatifida*, *Asplenium trichomanes f. incisum*, and others, ranking, as we see in each case, under a different name though one and all would be best described as *plumosum* or *plumosa* as the case may be, thus at once conveying to the mind the particular associate characters common to all.

Acton, London, W. England.

NEW ZEALAND FERNS AND FERN STUDY.

BY GEORGE E. SMITH.

In consenting to send you a few notes on the Ferns of New Zealand, I must say that I do so with great diffidence, as I feel that I am very incompetent and unfitted in many ways to do justice to so important a subject; still as I think we should all try to spread a knowledge of these beautiful plants, I shall make no further apology, but only crave indulgence for the errors I fail into while trying to tell you something of the ferns of New Zealand.

New Zealand in proportion to its size is rich in ferns, and their allies, and considering their profusion might well be termed a fern paradise, some 130 species and about 16 varieties being found here, together with 12 or 13 varieties of Lycopods—truly a very generous contribution to the world's list. In possessing some of these the islands can lay claim to special providence. Here may be found *Trichomanes Armstrongii*, said to be the smallest fern in the world, and whose full size does not exceed half an inch. The lordly tree ferns, again claim attention, attaining as they do, the height of 40 feet with drooping fronds 20 feet long. *Lygodium articulatum*, the climbing fern, grows to the top of high

trees and hangs down in festoons hundreds of feet long, and the wonderful richness and variety of the *Hymenophyllums*, alone would charm you. Imagine the ground literally carpeted with these rare and lovely gems of the fern world, and you will have some idea of what a beautiful sight it is with these plants in such profusion. *Loxoma Cunninghamii*, the only one of its class known to occur anywhere in the world, and the oldest fern of which geology has revealed the existence, is found growing north of Auckland. Then *Todea superba*, or Prince of Wales' feather, as it is sometimes called, is not the least among the fern beauties of New Zealand, if not the world. Nothing more beautiful can be imagined than this fern as seen growing in its native wilds. The kidney fern, too, (*Trichomanes reniforme*) and the fan fern (*Schizaca dichotoma*) both so peculiarly shaped, and quaint looking, tend to stamp the ferns of New Zealand as something out of the ordinary in the world's list of these lovely plants.

Nor did the natives find them as useless as many of their white brothers suppose them to be; from the trunks of the tree ferns he cut slabs to build his houses; *Pteris aquilina*, so widely distributed all over the North Island, was a staple article of food, being dried and the roots pounded and made into flour; with the long stems of *Lygodium articulatum* he bound the thatch on the roof of his house, constructed fishing nets, and made fishing hooks, out of the naturally curved stems of the same plant, *Pteris pustulatum* provided him with means for perfuming his oil, and in many other ways the ferns were made to minister to his comfort.

The earlier visits of botanists to New Zealand was between the years 1769 and 1777, when the great navigator Captain Cook, made three voyages to these islands, and he was accompanied by Sir Joseph Banks, George Foster, Dr. Solander, Reinwold, Dr. Sparman, and Dr. Anderson, as naturalists, who collected most of the ferns which grow in these islands. After their time the islands were explored by many French, English and Australian botanists, notably D'Urville, Hooker and Cunningham, with the result of adding more ferns to the list, and since then (1841) many more ferns have been discovered through the labors of botanists and scientific men resident in the colony. The labors of all these explorers have been collected and arranged by Dr.

Hooker in his hand-book of New Zealand flora, which was published under the authority of the government of New Zealand. This, however, only brought up the material collected to 1853, and many more ferns have been discovered since—*Lindsaya viridis*, *Trichomanes Armstrongii*, *Hymenophyllum Cheesemanii*, *Asplenium Japonicum*, etc.—and the field is still wide for further research. I am strongly of the opinion that there are many parts of New Zealand which are as yet only partially explored, and I am confirmed in this from the fact of *Asplenium Japonicum* having been found growing in the northern Wairoa district within the last few years. This fern is said to be found in the South Sea Islands, from whence it undoubtedly seems to have found a footing in the northern part of New Zealand, where it was first found by Miss Williams about eight years ago. It was next found at Kaitaia, and when passing still further south was found growing on the banks of the Northern Wairoa river. My own idea is, that coming from a much warmer climate it will not spread further into colder parts of the country but remain a native of the warmer north.

Coming now to the question of fern study it seems from all that I have been enabled to gather, that it is mainly confined to the scientific men connected with our museums, universities and public institutions. Surveyors, too, engaged in various parts of the country have in some instances taken great interest in the matter, notably Mr. Field, of Whanganni, who has written a book entitled, "The Ferns of New Zealand," said to be a very good work on the subject, and a Mr. Dobbie, who some years ago published two books of plates illustrating the ferns, which were very useful in making the plants more generally known. Various other books too have been written from time to time, with the very excellent idea of trying to make the study more popular and intelligible to the non-scientific. As yet there is no society of members banded together for the special study of ferns as in America, consequently there is not the same opportunity to compare results which is so much to be desired. Considering the differences that location, soil, and climate make in the different varieties, and which are sometimes so puzzling even to the scientific botanist, still I think the interest in ferns is increasing, as

more attention is being paid to their cultivation, and it is earnestly to be hoped that those species will be grown (*Trichomanes* and *Hymenophyllums*, especially) which are threatened with extinction through the cutting down of the forest which is both their shelter and their home.

Aratapu, New Zealand.

NOTES ON JAPANESE FERNS.

BY KIICHI MIYAKE, PH. D.

About two hundred and fifty species of ferns are known to grow wild in the Japanese Islands. If Formosa, which recently became a Japanese possession, be included, the number would be much greater. Japan thus has more species of ferns than the whole of the United States, three times as many as are found in the British Isles, and may be called one of the richest fern countries outside of the tropics. The Japanese Islands have been pretty well explored in the last thirty years, and nearly all of the flowering plants and ferns have been identified by botanists.

The majority of the Japanese ferns are herbaceous species, and tree-ferns grow only in the southernmost part of Japan, where also occur other sub-tropical and tropical species like those found in the East Indies and in the Malay Archipelago. There are a number of species of ferns, which are found only in Japan; thus more than half a dozen species are christened *Japonica*, or *Nipponicum*.*

Among the ferns which are more or less widely distributed in different parts of the world and which also occur in Japan, may be mentioned the following:

Pteris aquilina, *Adiantum pedatum*, *Scolopendrium vulgare*, *Osmunda regalis* (variety *Japonica*), *Aspidium filix-mas*, *Asplenium Trichomanes*, *Pteris cretica*, *Pteris serrulata*, *Lomaria spicant*, *Woodwardia rodicans* (var. *orientalis*), *Onoclea sensibilis*, *O. Struthiopteris*, *Osmunda claytoniana*, *O. cinnamomea*, *Botrychium lunaria*, and *B. virginiana*.

*Japan is called Nippon by its natives; the main Island of Japan is often called Nippon by foreigners.

Although almost every part of the country is rich in ferns, more species are found in the mountainous region. I collected over a hundred species in the vicinity of Kyoto, the former capital of Japan.

It is rather uncommon to find fern-pots in Japanese houses, but the fern ball is very frequently seen hanging on the porch. For the ball, *Davallia bullata*, called "Shi no bu" by the Japanese people, is almost exclusively used. This fern does not grow wild in the fields, but is found only in the mountains. It was so much hunted after, for ornamental purposes, that it is very scarce now, being one of the rare ferns for the collector, although common and well known in Japanese households.

Another fern, which is very familiar to the Japanese people, is *Gleichenia longissima*, commonly called "Urajiro-shida" (fern with white under surface), or more commonly simply "Urajiro" (white underneath). This is used for ornamental purposes, but is somewhat different from the above mentioned species of *Davallia*. The leaves being evergreen are used as a sort of decoration on New Year's day, being placed above the house entrance or gate.

The young shoots of *Pteris aquilina* (Japanese name "Warabi") and *Osmunda regalis* var. *Japonica* ("Zenmai" in Japanese) are very commonly eaten by the natives. The plants are gathered before the leaves unfold, while the shoots are still fiddle-head shaped. They are sometimes cooked while fresh, but more often they are sold in the markets dried. Starch also is made from the rhizoma of *Pteris aquilina* and is very good for food.

The Island of Formosa is very rich in ferns, being located on the border line of the tropical and the temperate zones. The Tropic of Cancer passes through the middle of the island. I was fortunate enough to travel through the Island for several months, and although unable to devote all my time to ferns, still I collected over a hundred species. More than half of these seem to grow also in the Loo-Choo Islands, the southernmost group of islands of the former Japanese Empire.

The Japanese ferns have interested a number of foreign-botanists. Among the more recent workers are Franchet, Baker, Christ, Luerssen, Eaton and Maximormiz. Although there are

not many fern specialists in Japan, amateur collectors and fern lovers are not scarce. The interest of botanical students in the ferns has very much increased in recent years, as can be seen from the fact that the membership of the Tokyo Botanical Society now numbers over 300.

One great trouble for fern students in Japan is the absence of a complete manual of ferns. There are a number of books, which may be used for reference; as, Franchet et Savatier's "Japanese Flora," and Prof. Matsumura's list of Japanese plants. The Japanese ferns are also described and illustrated in a pamphlet of the Japanese flowering plants and ferns, which is issued monthly by Mr. T. Makino, who has done more to make Japanese ferns known than any other native botanist. What Japan needs to promote fern study is a little manual of ferns corresponding to Prof. Underwood's or Mr. Clute's books in this country.

Cornell, September, 1902.

HISTORICAL SKETCH OF THE LINNEAN FERN CHAPTER.

BY B. D. GILBERT.

The ending of the tenth year of the existence of the Linnaean Fern Chapter seems to be a proper time to pass in review the history of this organization. The fact that within ten years it has grown from eighteen charter members to a membership of 120 persons is alone sufficient to indicate its importance and usefulness.

Early in 1893, Mr. Willard N. Clute, Mr. J. A. Graves, Mrs. A. D. Dean and Mrs. T. D. Dershimer, all lovers of ferns, but not at that time skilled students of them, conceived the idea of starting a chapter of the Agassiz Association for the scientific study of ferns by correspondence. The charter was held open during the summer of 1893 and by Autumn there were nineteen members with which number the Chapter started. At first there was no published Bulletin to disseminate the knowledge gained, but written notes were circulated by mail among the members. This plan, however, was not found to be very satisfactory and in

July, 1893, the first number of an exceedingly modest little pamphlet was published, bearing the inscription: "The Linnaean Fern Bulletin, No. 1. Published by The Linnaean Fern Chapter. Price Five Cents. Binghamton, N. Y., 1893." This contained a paper cover within which were twelve pages of print including the title page. The size of the brochure was only $3\frac{1}{2} \times 5\frac{1}{2}$ inches. In 1896 it was enlarged to $4\frac{3}{4} \times 6\frac{1}{2}$ inches, and in 1897 it was again enlarged to its present size.

The publication of this little quarterly at once began to stimulate interest in the study of ferns and to bring in new members. Observation was quickened, the spirit of discovery was aroused and the range of many species was greatly enlarged. From Maine to Florida, to California and Washington there came accessions to the ranks of the Chapter, until at the present time it contains a larger number of members than the British Pteridological Society, which was organized two years earlier.

The first president of the Chapter was Mr. Willard N. Clute, who was retained in the office nearly four years. Owing to the pressure of other duties, Mr. Clute resigned in July, 1896, and Mrs. T. D. Dershimer, then vice-president, acted as president through the remainder of that term. Mr. C. E. Waters was elected president in the fall of 1896 and served during the years 1897 and 1898. Our third president was Mr. Alvah A. Eaton, whose term expired with the close of 1899, and who declined a re-election. Mr. W. R. Maxon, connected with the botanical section of the Department of Agriculture at Washington, succeeded Mr. Eaton and served during the years 1900 and 1901. And in the fall of 1901 the present writer was chosen to succeed Mr. Maxon.

In the responsible position of treasurer, Mr. Reuben M. Strong, of Oberlin, Ohio, served during the first year of the Chapter's existence. At the second election Mr. James A. Graves, of Susquehanna, Pa., was chosen treasurer and by the unanimous wishes of the members he has continued to serve ever since. Our secretaries have been Mrs. T. D. Dershimer, Mr. C. E. Waters, Mr. A. A. Eaton, Miss Margaret Slosson and Mr. H. D. House.

THE FERN BULLETIN which was at first published by the Chapter, was in July, 1895, taken over by Mr. Clute, who had always been the editor, and has since that time been published by him. It still, however, remains the organ of the Chapter. It is liberal in its views and gives publicity to the ideas of well-informed writers, whether they agree with those of the editor or not. In this way, different sides of controverted questions are presented to its readers and they are allowed to choose for themselves which is right and which is wrong.

One of the prominent features of the Chapter has been the offer of specimens of rare species to its members at a merely nominal price to cover postage and packing. The value of this privilege may be judged from the list herewith given of species that have been offered: *Asplenium cuneatum, montanum, pinnatifidum* and *ruta-muraria*; *Botrychium tenebrosum, obliquum*; *Camptosorus*; *Chielanthes Clevelandii*, and *lanosa*; *Cystopteris bulbifera*; *Dryopteris fragrans, Goldieana, marginalis, simulata*; *Lycopodium lucidulum, Selago, tristachyum*; *Lygodium palmatum*; *Marsilia quadrofolia*, *Osmunda cinnamomea frondosa*; *Ophioglossum arenarium, vulgatum*; *Pellaea atropurpurea* and *gracilis*; *Polystichum acrostichoides incisum*, *Polypodium incanum* and *Scouleri*; *Scolopendrium*; *Selaginella apus, rupestris* and *cinerascens*; *Trichomanes Petersii*; *Woodsia Ilvensis*; *Woodwardia angustifolia* and *Virginia*.

Another advantage belonging to membership in the Chapter is the receipt of a considerable amount of fern literature without extra cost. During its existence the Chapter has distributed free among its members the following publications: first, "The Pteridophytes of North America North of Mexico," a list compiled by a committee of the Chapter. Each member received a copy of this free, but a much larger number was sold, as at the time it was a standard of the nomenclature acknowledged in 1895. Next came Mr. Clute's "Ferns of the Upper Susquehanna;" and in 1898 Raynal Dodge's "Ferns and Fern Allies of New England" was sent free to all members in good standing with the treasurer. A pamphlet by Mr. Clute, entitled "Ferns and Fern Lore" soon followed. The next pamphlet for free distribution was "Papers Presented at the Boston Meeting, Aug. 23, 1898."

Following this came "The Fernwort Papers Presented at a Meeting of Fern Students Held in New York City, June 27, 1900." Since then there have been sent to members of the Chapter W. R. Maxon's "List of the Ferns and Fern Allies of North America North of Mexico," B. D. Gilbert's "List of North American Pteridophytes," and C. E. Water's "Analytical Key for the Ferns of the Northeastern States, Based on the Stipes." Here are nine publications that have been distributed gratuitously among members of the Chapter in eight years, and another will be forthcoming this year in the shape of a complete index to the FERN BULLETIN.

By an amendment to the constitution adopted early in 1894, associate members were received at one-half the dues of full members. This was found to be a vicious and impracticable rule, and after a trial of five years the constitution was again amended, dropping associate members altogether. As a full membership costs only one dollar a year, which includes a free subscription to the BULLETIN, those who are at all interested in ferns willingly pay this for the privileges which the Chapter confers.

Two general meetings have been held by the Chapter during the ten years of its life. The first of these took place at Boston in August, 1898, during the week of the annual convention of the A. A. A. S. Twenty members were present, besides a large number of persons who were more or less interested in ferns. The meeting was held in the hall of the Horticultural Society, and Mr. George E. Davenport and others made a fine display of ferns, both mounted and growing in pots. Seven papers were read which were afterward published in pamphlet form, and the meeting was much more successful than had originally been anticipated. The second meeting was held at Bronx Park, New York City, in June, 1900. Dr. L. M. Underwood had arranged for a display of herbarium specimens of the new or recent Lycopods, and everybody was interested in examining their peculiarities. About the same number of members were present as at the Boston meeting, but only five papers were read owing to lack of time; three others by members who were not present were read by title only, but all were afterward published in the "Fernwort

Papers," a pamphlet containing a full report of the papers prepared for the meeting.

After this brief sketch of what the Fern Chapter has accomplished within the short space of ten years, it hardly seems necessary to urge upon our readers the advantages of membership in the Chapter. To any person who takes the slightest interest in ferns, these facts speak loudly for themselves. The BULLETIN as a medium for the publication of new facts and discoveries; the receipt of many new fern publications without extra charge; the opportunity to obtain a number of rare species at a merely nominal cost, and the comradeship of many fern collectors and enthusiasts scattered all over the United States, who are willing to correspond and to make exchanges; these would seem to be sufficient in themselves to induce a much larger number of persons to become members and to aid in developing a knowledge of the fern flora in the particular regions where they reside. If each member will do a small amount of missionary work, we can double our present numbers within a year.

A NEW EQUISETUM.

BY ALVAH A. EATON.

Several years ago I received from Mr. C. K. Dodge, of Port Huron, Mich., specimens of an *Equisetum* for determination, which, from external aspect, were referred to *E. laevigatum*. A careful study of an abundance of material of both this and undoubted *laevigatum*, collected in nearly every State west of the Mississippi, has shown it to be really a variety of *hiemale*, intermediate between that and *laevigatum*, possessing the internal characters of the former with most external ones of the latter. In most characters it agrees with *E. Moorei* Newm. (*hiemale Schleicheri* Milde), ascribed by Milde to this country, probably on material identical with this, but the stems of this are usually persistent, and (except inconstantly in Suksdorf 2134, Washington) the angles are beset with cross-walls or silex instead of two rows of dots. From its position between the American form of *hiemale* and *laevigatum* I propose to call it *E. hiemale intermedium*.

Stems 1-4 ft. high, 1-4 twelfths of an inch in diameter, usually simple the first year, not rarely bearing a few branches the second year, 20-30 angled, nearly smooth or usually rough with transverse bands of silex on the ridges, and rarely in the grooves also, which are otherwise naked (except in one instance).

Lumen (cavities in epidermal cells) about equaling the cell-walls in thickness (narrower than in *laevigatum*), the borders beset with bristle-like protuberances, as in *hiemale*.

Sheaths $\frac{3}{4}$ as wide as long, spreading upward, the lower 3 or 4 usually with black basal rings and often a whitish band above, the rest concolorous with stem the first year, gradually becoming ashy with age and the mouth incurving and contracted. Leaves centrally keeled below, usually with two lateral ridges above, those of the basal 3-6 sheaths usually concave in the middle, all narrowed upward and bearing at least a brown central spot, usually larger and confluent into a narrow limb which is relieved by a small hyaline commissural border.

Commissures sensibly widened upward. Teeth thin, brown, flexuous; caducous, deciduous or persistent, usually with a white transparent border, cohering by their edges in groups, centrally dark brown, usually fading and becoming papery if long persistent, firmer toward the base and with a central groove that is decurrent into the horny leaf-tip, or even half the length of the leaf. Spike usually more apiculate than in *laevigatum*. Anatomy of *hiemale*, the carinal bast reaching nearly to the carinal hole, separating the green parenchym, while the vallecular bast is only 2-4 cells high, the parenchym being continuous under it, an arrangement just the opposite from *laevigatum*.

A well characterized variety with sheaths more like European *hiemale* than noted in any other American form, but the ridges have bands of silex instead of two rows of tubercles. The small stems and branches when present are usually very rough, leaves usually centrally grooved, teeth usually persistent, with a broad white membranous border, the brown center usually fading. The aspect is usually sufficiently different from *laevigatum* to be easily separated without recourse to anatomical examination.

Milde certainly, and A. Braun probably, based their descriptions of *E. laevigatum* on this plant. Possibly it forms Engel-

mann's variety *clatius*, although nothing in the description would bear out the surmise.

I have seen this variety from twenty-five different localities, extending from Port Huron, Mich., (Type) to Ind. Ter., S. Calif. (Death Valley) to Washington. Specimens from Berkeley, Cal., bear rosulae in the grooves, and some Washington plants occasionally bear two rows of tubercles on the ridges, otherwise it appears fairly constant except in aspect.

Rev. J. M. Bates collected an interesting form in Nebraska, which may be called *forma polystachyum*. In this the stem becomes branched at the upper nodes and bears 10 spikelets.

WILLARD NELSON CLUTE.

During the time that the editor of the FERN BULLETIN has been soliciting photographs of fern students for publication, he has frequently been advised to take his own prescription by giving a portrait of himself to the public; but with the modesty characteristic of editors, he felt that he should wait until more of those better entitled to the honor had been presented. He ventures to appear now, largely in order that the absence of his portrait may no longer be urged by others as an excuse for not appearing.

Willard N. Clute was born at Painted Post, Steuben County, N. Y., February 26, 1869. His youth was spent in various towns in New York and Pennsylvania, whither the occupation of his father, as lumber inspector, carried the family. "The little red school house" is his Alma Mater and such knowledge of science as he possesses was acquired by hard study since graduation from that institution. His leaning toward ornithology and botany was noticeable from an early age, but living in towns where there were neither teachers nor available books, he found it exceedingly difficult to get on in such studies and ever since has had a lively sympathy for beginners similarly handicapped.

His first publishing venture was in the capacity of editor and part owner of *The Ornithologist and Botanist*, which was carried through one volume and then sold. Following this he was for some time editor of the *Bulletin* of the Wilson Ornithological Chapter. He was one of the founders of both *The Bryologist* and

The Plant World, becoming half owner and the first publisher of each. He is now editor and owner of *The American Botanist*, in addition to his interests in *THE FERN BULLETIN*. He was one of the founders and first president of the Linnean Fern Chapter; secretary, and later, president of the Wilson Ornithological Chapter; one of the founders of the Binghamton Academy of Science, and its first secretary; and is now president of the American Botanical Club, which he also helped to found.

In 1886 he took up his residence in Binghamton, N. Y., which city has since been his headquarters, though he has occasionally resided elsewhere. He spent three years at the New York Botanical Garden, going there to take charge of mounting the herbarium at a time when the garden's principal possessions were some hundred acres of unimproved park land and a director-in-chief. In 1900 he spent about three months collecting in Jamaica, bringing back nearly 300 species of ferns, several of which were new species. The winter of 1901-2 was spent in New Orleans, where numerous observations on the ferns were made.

In 1898 he published a "Flora of the Upper Susquehanna," in 1901, "Our Ferns in their Haunts," and in 1902, "A Fern Collector's Guide." He has also contributed to the periodical press numerous articles on archaeology, entomology, ornithology and botany. In botanical matters he is of conservative tendencies and while recognizing the necessity for the occasional description of new species has steadily opposed the giving of specific rank to mere forms. In nomenclature he prefers the name by which each species has been longest known, quite regardless of "priority."

For two years I have been watching a plant of *Botrychium obliquum*, which is the only one in sight on the banks of a stream in the Catskills. In 1900 it produced both sterile and fertile fronds, but this year only the sterile fronds appeared, and I shall watch with interest to see what happens next year.—*Mary F. Miller*. [It is just such observations as this that really advance our knowledge of the ferns. Already the question of whether the *Botrychiums* rest for a year seems half solved. We need several more observations of this kind to make sure and an equal number of experiments with *Ophioglossum* would be of much value.—*Ed.*]

EDITORIAL.

Constancy seems to be one of the cardinal virtues of fern students for the names written down at the head of our subscription list, nearly ten years ago, are still there, with trifling exceptions. During this time we have not been unmindful of the personal interest that these subscribers, as well as those who joined us later, have taken in this journal—the kind of interest that prompts many of them to speak of it as "our magazine," and to be ever on the alert to capture the elusive new subscriber. We have thoroughly appreciated, also, the encouraging letters, helpful suggestions, friendly counsel and kindly criticism received, and although we have not always been able to reply personally to such letters, we have been none the less gratified at receiving them. Without the aid of the friends who have thus made our cause their own, we know that the FERN BULLETIN would have achieved a much smaller measure of success, and now, as we turn towards a new decade of fern study, we take the opportunity to thank all who have contributed to our past advancement.

* *

So many subscribers have recently expressed their intentions of having their FERN BULLETINS bound, that we take the liberty of calling attention to the work of the Messrs. Neumann Brothers, of No. 7 East 16th street, New York. The editor's own copies are bound by this firm and he takes pleasure in stating that he has never seen better examples of book-binding for the money. The trouble with small volumes bound by the ordinary book-binder is that the backs are too stiff and the books cannot be opened easily, nor will they stay open. Books bound by the Neumanns open easily and stay open, but without the least suggestion of being loosely put together. The binding on the editor's copies is of gray cloth with gilt lettering on side and back. A model is always kept at the book-binders, and those who wish their copies bound, need only send them to these binders with a request that they be bound like the editor's, to be sure of a good job. Single volumes are bound for 75 cents, but if preferred two volumes may be bound as one for the same price. Any color of covers may be selected

without extra cost. The advantage of having volumes bound by the Neumanns is that no matter what intervals elapse between the binding of different volumes, the style will remain the same.

* *

This issue has been much delayed by the special articles. Many articles and notes including the list of species and varieties described during the past ten years have had to be held over for the next issue.

* *

In the forthcoming volume of the FERN BULLETIN considerable space will be devoted to subjects connected with the cultivation of ferns. A large number of our readers own conservatories in which ferns are grown, and we would be glad to have contributions from them regarding their successes. Notwithstanding the space given to fern culture, there will be no diminution of the scientific articles. A new and important feature will consist of the fern flora of each State in the Union, written by the most prominent student of ferns in each State. There will also be a series of illustrated articles upon the strange and curious ferns in other lands, and the portraits and biographical notices of fern students will be continued.

NOTES.

The specimens from which *Trichomanes radicans* was described, were collected by Swartz in Jamaica. The question then rises whether the plant of the United States is the same thing. Mrs. E. G. Britton thinks it is not and in the *Torrey Bulletin* for July says our species should be called *T. Boschianum*.

In *Torrey* for August Dr. M. A. Howe records the results of some experiments in germinating the spores of *Marsilia*. Cases are known in which spores of *M. Aegyptica* germinated after being kept in the herbarium twelve years, while those of *M. quadrifolia* have grown readily after being preserved eleven years, some after being kept for three years in 95 per cent. pure alcohol. Dr. Howe, however, has been able to extend the known

period of vitality still farther, by germinating spores of *M. vestita* that are known to have been collected eighteen years.

In *Rhodora* for January, Mr. G. E. Davenport has outlined his position upon the generic names to be used in the tribe Aspidieae. He limits the name *Aspidium* to certain exotic species with peltate indusium and anastomosing veins. *Polystichum* is adopted for the New England species with free veins and peltate indusia of which the Christmas fern is an excellent type. For the group represented by such forms as the wood ferns, marsh ferns, etc., with reniform indusia attached at the sinus, the name *Nephrodium* is used in place of *Dryopteris*. These names, it may be added, are now in use by the majority of writers, both in this country and in Europe.

For a long time the evidence against the specific distinctness of *Asplenium ebenoides* has been accumulating. Many were fully convinced that it was a hybrid, but the production of at least one plant by crossing its supposed parents was necessary to set all doubts at rest. This has now been done by Miss Margaret Slosson, who writes of her work in the *Bulletin of the Torrey Botanical Club* for August. By sectioning the prothallia of *Asplenium ebeneum* and *Camptosorus rhizophyllus*, and planting archegonia of one species against antheridia of the other and vice versa, she has at last been able to produce a plant with all the essential characteristics of *Asplenium ebenoides*. Not the least interesting of the facts brought out by the experiments is that the parents of the hybrid are the very species long ago assumed likely to be, though they belong to different genera.

BOOK NEWS.

The *Journal of Mycology*, after a lapse of several years has again made its appearance. It is edited by Prof. W. A. Kellerman and bids fair to be of much usefulness to students of the fungi.

Those who are fond of books on out-of-door subjects will be delighted with "Next to the Ground,"* by Martha McCullough Williams. It has the distinction of being written in the South about southern plants and animals by a Southerner, a combination not heretofore encountered in outdoor literature.

**Next to the Ground*, by Martha McCullough Williams, New York. McClure, Phillips & Co. 1902, pp. 380. \$1.20 net.

The author has an original and attractive style and her observations on the natural history of the middle South are both interesting and instructive. Among subjects not strictly in the line of natural history, which the book includes, may be mentioned, ploughing, shooting, clearing and night noises. Unless one has spent a season in Kentucky or Tennessee, he will be astonished to find how very much the customs of that part of the world differ from his own, and entertained by the author's description of them. In the opinion of the reviewer, the book is one of the best of its class.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

ANTHONY, MRS. E. C. *Fern Hunting in Nassau*. Fern Bulletin, Jl. 1902.

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mon Horsetail,* illust. Bulletin No. 95, Vermont Agricultural Ex-
periment Station, Je. 1902.
- SLOSSON, M. *The Origin of Asplenium ebenoides,* illust.
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- WATKINS, W. G. *Some Ferns of the Sierra Nevada Range.*
Fern Bulletin, Jl. 1902.
- . *The Boston Fern and its Varieties.* American
Gardening, Je. 21, 1902.
- . *The Genera in Aspidieae.* Fern Bulletin, Jl. 1902.

THE LINNEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—A complete index to THE FERN BULLETIN, to the end of the tenth volume, will be published before the beginning of next year, and all members of the Chapter who have paid their dues for this year, will receive a copy free.

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—The president would appeal to members to offer specimens to the Chapter more frequently. As ex-President Maxon said, in his last report, "Good specimens, with full data, are always valuable for purposes of comparison, even if the species be as common as *Asplenium Trichomanes*. This should be one of the invaluable privileges of membership.

A REMARKABLE COLLECTION

There has recently been placed in my hands for sale, one of the largest collections of New Zealand ferns ever sent to America. These specimens were collected in the vicinity of Dunedin, N. Z., by Mrs. C. C. Armstrong. Some idea of the size of the collection may be gained from the fact that it was invoiced at fifteen hundred dollars. It is in two series, one, unmounted, contains sets of 43 different species each, at the uniform price of 7c a specimen, or \$3.00 for the set, carriage paid by purchaser. The other consists of sets of 31 cardboard sheets, 12x18 inches in size, upon which are mounted about 100 specimens, illustrating 53 species. The cardboard is of the best quality, the mounting faultless, and the sets form one of the finest show collections imaginable, being mounted for decorative effect, with often several different species on a sheet. Price, 10c a sheet, or the set of 31 for \$3.00, carriage paid by purchaser. The specimens are all correctly named, with printed labels. This is the best opportunity to obtain foreign ferns ever offered fern students. American ferns are often sold for 10c a sheet, but the magnitude of this collection makes it possible to offer these at 3c less. Order at once, as the complete sets are limited. Terms for smaller sets or for the thousands of duplicates, upon application.
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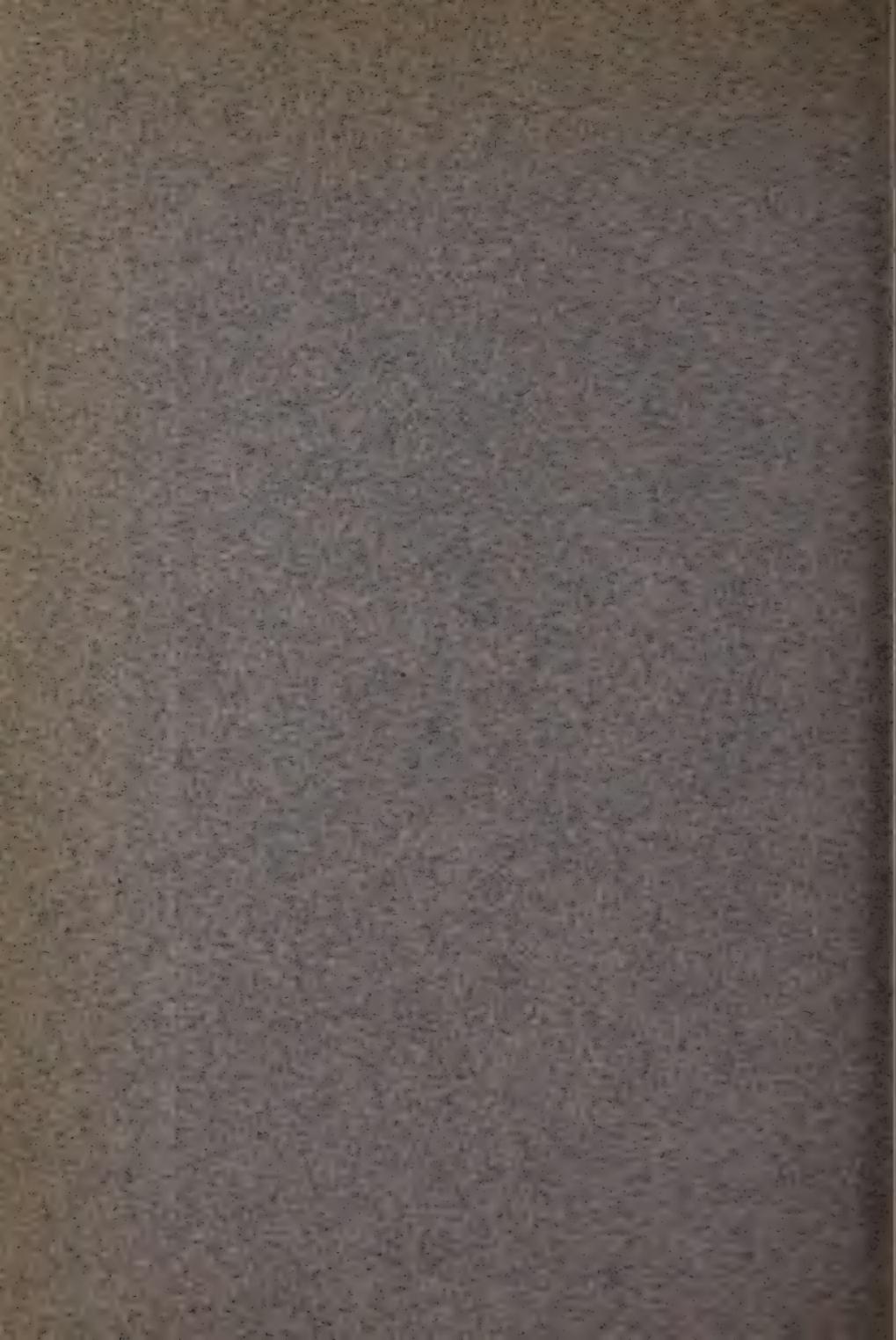
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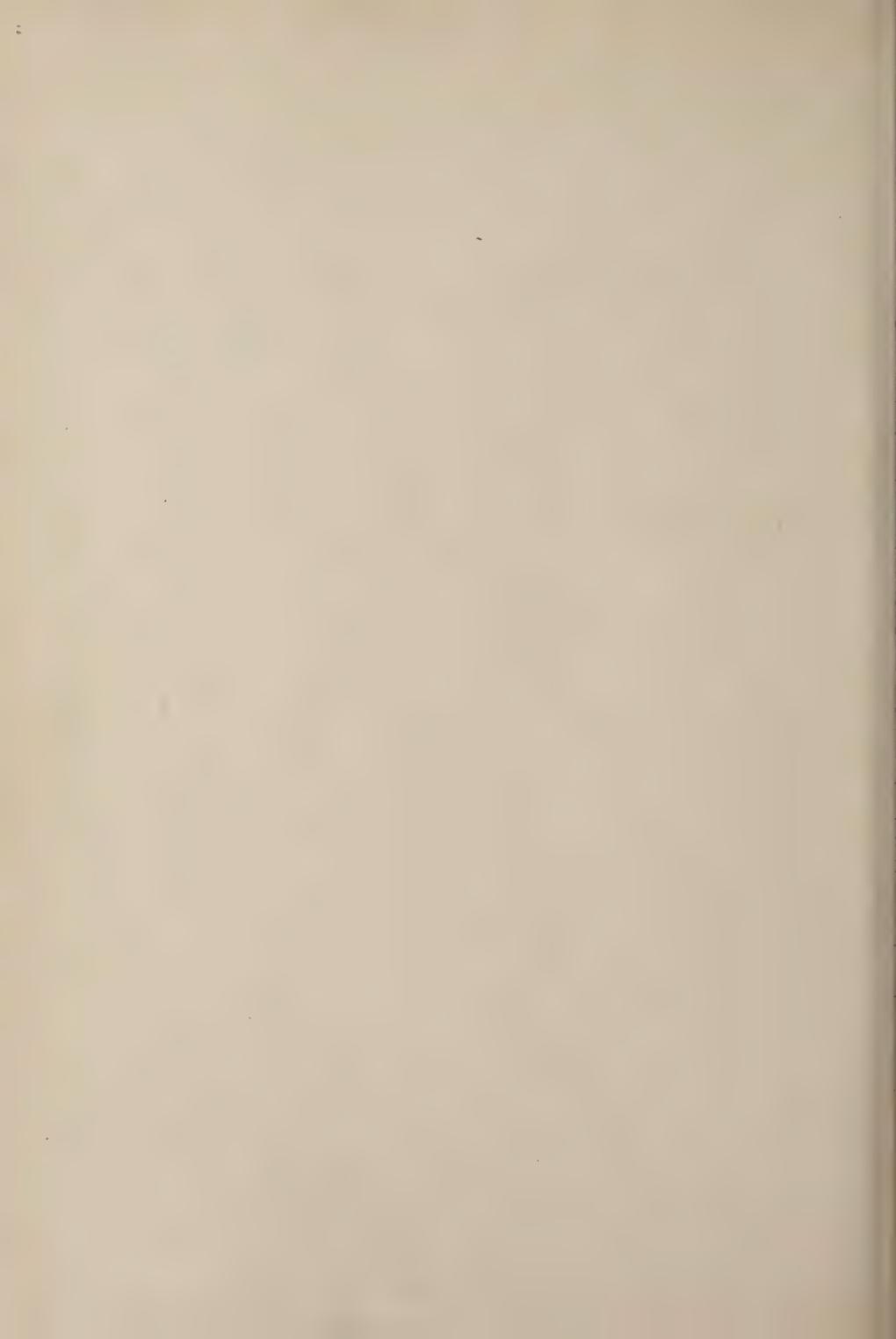


PREFACE

The following Index is separated into five parts, viz., General Index, Index to Species Mentioned, List of Contributors, List of Publications Noticed, and List of Illustrations. The first part contains all communications that are signed, together with editorial and other matter. In the second part every species is indexed about which any fact is stated, but not when it is included in a mere enumeration of what was seen in connection with some other species which is the subject of the article. Nor, as a rule, are foreign species indexed unless they occur also in this country. Where a variety occurs, if it is not indexed separately, its name follows immediately after the number of the page, and is enclosed in brackets. All names of genera and species are indexed exactly as they are used in the text: if *Aspidium* is originally used then it is so catalogued, and the same with *Dryopteris*, or *Nephrodium*, or *Athyrium*, or whatever it may be.

The first twelve numbers of the BULLETIN were numbered consecutively and paged separately, not being in volumes. This makes them a little awkward to index; but, in order to indicate these early issues, hyphenated numbers have been resorted to, the figure before the hyphen indicating the number of the issue, and that after the hyphen telling the page of that particular number. After these issues, the figures bear their usual meaning of volume and page. The articles A and THE are not used as index words, but following after the rest of the title, with a comma between.

B. D. GILBERT,



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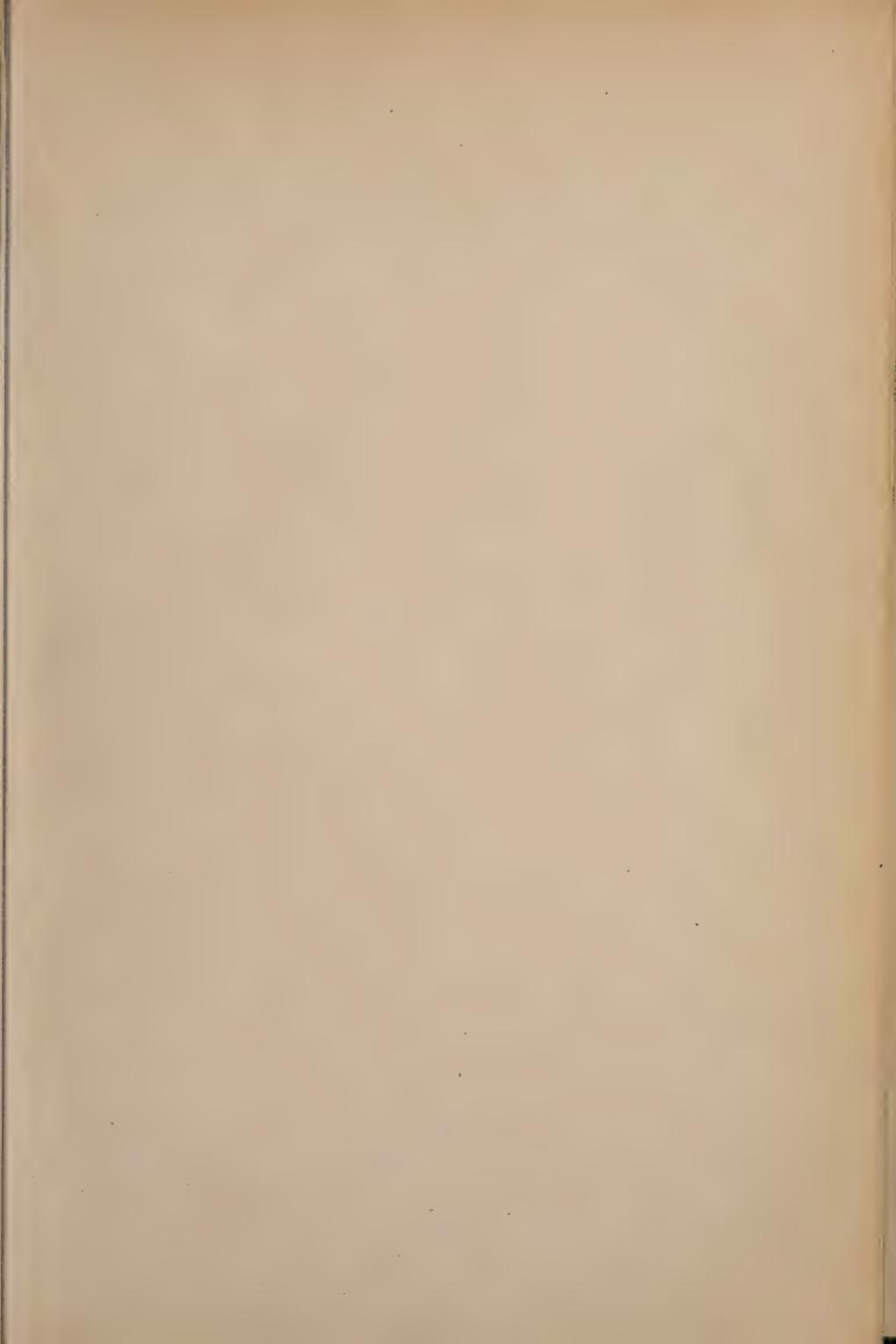
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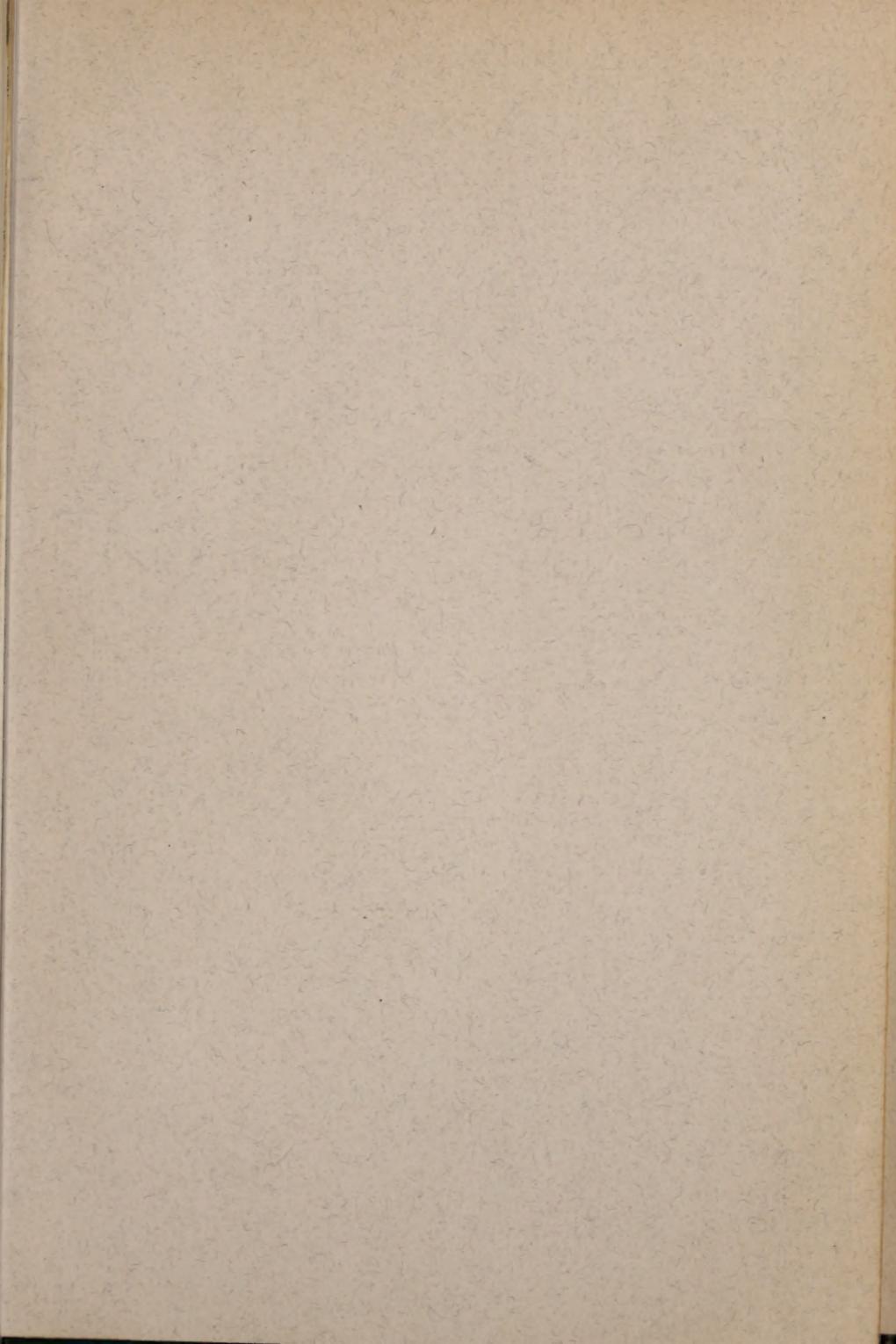
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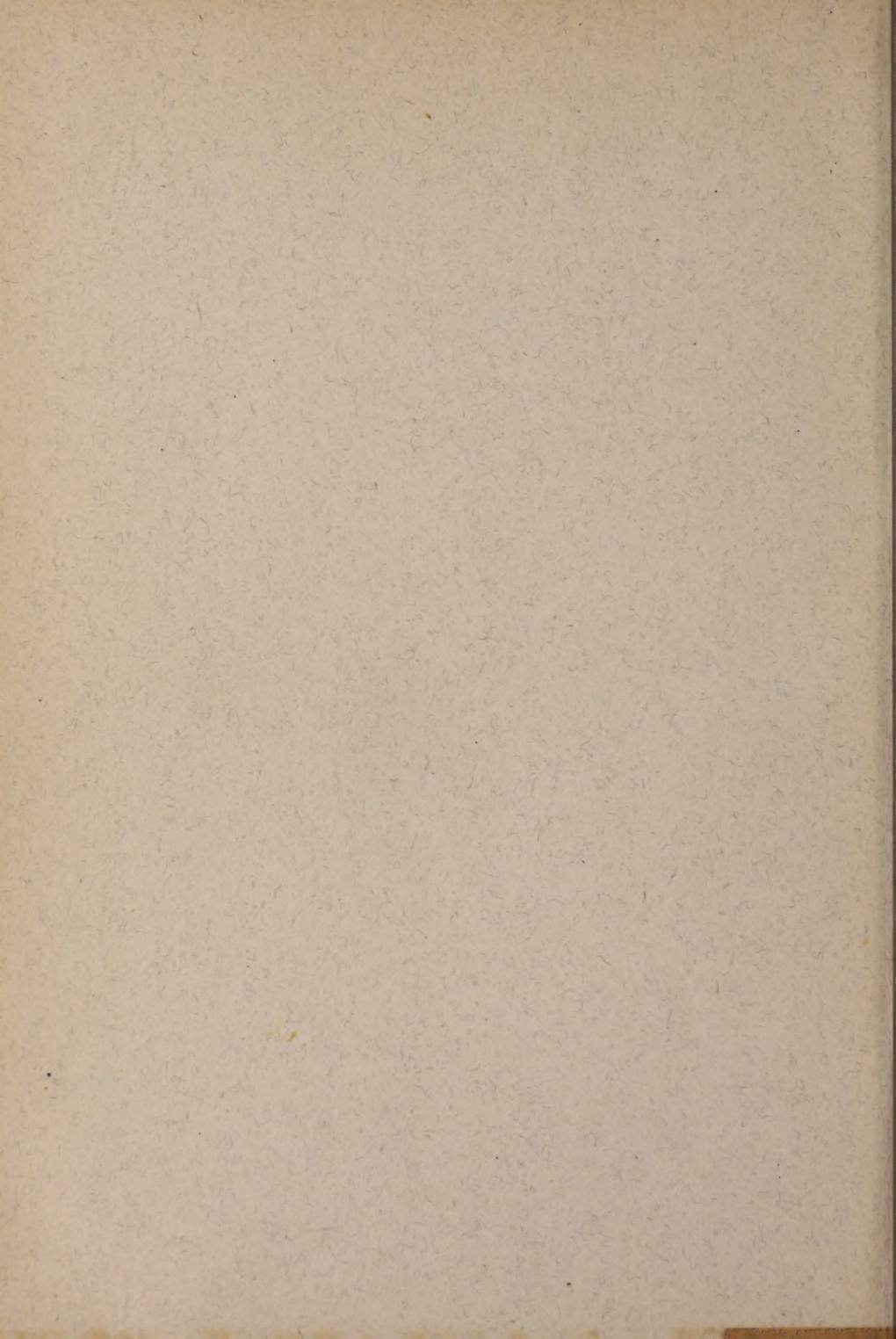
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